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ABSTRACT

In order to help students to be more efficient decision makers, it is essential to consider individual differences in the decision making process. The problem of this study was to determine the influence of specific internal and situational factors on the amount of information demanded prior to making risky decisions. Factors studied were category width, need to achieve, fear of failure, utility of reward and payoff. Measures employed were the Category Width Scale, the Mandler Sarason Test Anxiety Questionnaire, a group form of the TAT, a Preference for Risks test, and the Numerical Ability subtest of the Differential Aptitude Tests. Subjects were 186 male students who were high school juniors. Results indicate that, in general, when there was no reward or incentive, the motives "fear of failure" and "the need to achieve" were not elicited to differentiate subjects' strategies in decision making. Under conditions in which there are no specific goals, subjects do seem to employ a consistent cognitive strategy in the amount of information needed prior to decision making. This was seen as unrelated to intelligence. A logical followup of this study would be an examination of differences in information demand when individuals are given feedback. (Author/CJ)

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Beatrice Harris

Division of Teacher Education
The City University of New York
535 East 80th Street
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U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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My special thanks go to the Office of Education for their financial support of this project.

SUMMARY

Students are inundated with pressures to make decisions whether they are career decisions or the day-to-day decisions necessary to learning conceptual material or do problem solving. In order to help or train students to be more efficient decision-makers, it is essential to consider individual differences in the decision-making process, and to understand the personality of individuals as it relates to a particular decision-making strategy.

The problem was to determine the influence of specific internal and situational factors on the amount of information demanded prior to making risky decisions. The factors studied were category width, the need to achieve, fear of failure, utility of reward and payoff.

The following measures were used: (1) The Category-Width scale was used as the measure of category width. (2) The Mandler-Sarason Test Anxiety Questionnaire to measure fear of failure. (3) A group form of the TAT, administered under neutral conditions using four pictures, to measure the strength of the need to achieve. (4) The subjective value of the reward was inferred from the subject's performance on a Preference for Risks test. (5) Information demand was measured by the number of clues demanded by the subject prior to making a decision on an expanded judgment task. Two forms of the task were administered, one under non-payoff conditions, the other under payoff conditions. Under payoff conditions subjects received a reward for a correct decision and had to pay for information. (6) Scores on the Numerical Ability subtest of the Differential Aptitude Tests were used as a measure to control for numerical ability.

One hundred and sixty-eight male students in their junior year of the New York City public high schools served as subjects for this study. The following results were obtained:

1. Subjects took greater risks under payoff conditions than under non-payoff conditions when making a decision for which additional information cost money.
2. Broad categorizers took a more conservative strategy in decision making under non-payoff conditions than narrow categorizers.
3. Category width did not differentiate subjects in their willingness to take risks when making a decision for which success brought a monetary reward.
4. Money had no absolute value to individuals; its subjective value could be measured.
5. When making decisions for which success brought a monetary reward and there was a cost for information, subjects who valued the reward more took greater risks.
6. Need achievement, considered by itself, did not differentiate subjects in their willingness to make risky decisions.
7. Fear of failure, considered by itself, did not differentiate subjects in their willingness to make risky decisions.

8. The motives fear of failure and the need to achieve when considered together did not differentiate subjects' risk taking behavior in decision making when that decision task is an isolated experience.

In general, when there was no reward or incentive, the motives fear of failure and the need to achieve were not elicited to differentiate subjects' strategies in decision making. Also, with no incentive an individual's intelligence was not employed to develop a strategy. When a monetary incentive was offered, the subject's value of money affected his behavior when making decisions, overriding motives such as the need to achieve and fear of failure. Subjects who were bright did not use their intelligence until it was useful to do so. With a monetary incentive they developed a strategy of risk to obtain greater monetary rewards.

Under conditions in which there are no specific goals, which vary in their subjective value for individuals, subjects do seem to employ a consistent cognitive strategy in the amount of information they require before they will come to a decision. This was seen to be unrelated to intelligence. Therefore, when students are involved in concept formation, in all areas of learning, it would be important to consider that some students require more examples than others, and that this is due to a difference in learning strategy rather than ability. Also to be noted is that one cannot assume that a student does not have ability if he is not performing in a situation that is not meaningful to him. Unless goals are made clear and meaningful, students may not necessarily use their aptitude to develop intelligent strategies for learning.

A logical follow-up of this study would be an examination of differences in information demand when individuals are given feedback. This in some ways may bear on the learning that takes place in programmed instruction. Programmed instruction feeds information to the learner upon which he is tested and given immediate feedback. This learning situation appears to be analogous to the one under study and may in some instances even take into account individual differences in information gathering behavior. Thus far, studies in programmed instruction have not been given this focus and may be ignoring one important aspect of its success or failure.

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CHAPTER I

THE PROBLEM

Introduction

One important aspect of contemporary man's behavior is his decision-making activity. Seldom can these decisions be made on the basis of available information. Most often they involve the acquisition of knowledge relevant to the final outcome. The gathered information which is thought to be necessary to make the decision may be costly and the extent of its relevance is seldom guaranteed.

The behavior of individuals in the decision-making process which requires the collection of data has been studied by many researchers. Westcott,[1] Kogan and Wallach,[2] and Irwin and Smith have found stable individual differences in the amount of information subjects require before they attempt a solution. Westcott did not have his subjects pay for information, but directed them to work out the problem using as few clues as possible. Kogan and Wallach had their subjects pay for the information leading to a payoff decision. They found the differences in the amount of information requested were strongly influenced by the moderator variables "anxiety" and "defensiveness". Irwin and Smith found that subjects requested more information when the information given them showed the greatest variance in content.[1] In another experiment conducted by Irwin and Smith, the amount of information required for decisions would increase with the value of the payoff for correct decisions and decrease with increased cost for information.[2]

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[1] M. R. Westcott, _Toward a Contemporary Psychology of Intuition_, New York: Holt, Rinehart & Winston, Inc., 1968.

[2] N. Kogan and M. A. Wallach, _Risk Taking: A Study in Cognition and Personality_, New York: Holt, Rinehart & Winston, 1964.

The present investigation was conducted to examine the influence of specific internal and situational variables on the amount of information needed to make a decision.

General Problem

How do category width, the need to achieve, fear of failure, utility of reward, and payoff influence information demand on an expanded judgment task?

Specific Problems

1. Is there a difference between a payoff and non-payoff situation in the amount of information subjects will demand prior to making a decision?
2. How does category width affect the amount of information subjects demand before making a payoff or non-payoff decision?

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[1] F. Irwin and W. A. S. Smith, "Further Tests of Theories of Decision in an Expanded Judgment Situation," Journal of Experimental Psychology, 1956, 52, 345-348.

[2] F. Irwin and W. A. S. Smith, "Value, Cost, and Information as Determiners of Decision," Journal of Experimental Psychology, 1957, 54, 229-232.

3. Do subjects for whom the reward has greater utility demand more information than subjects for whom the reward has less utility?
4. Do subjects who have a high need to achieve demand more information than those who have a low need to achieve?
5. What effect does fear of failure have on the amount of information subjects demand prior to making a decision?
6. What is the effect of the interaction of fear of failure and need to achieve on information demand?

Definition of Terms

Category width.--The term 'category width' refers to the range of values assigned by an individual to the attribute of a category. When individuals are given the average dimension of a category, e.g., width of window, and asked to give the corresponding range, they are consistently broad, medium, or narrow in their category widths relative to the total sample. The dimension was tapped by the Category-Width scale.[1]

Utility.--Utility is an arbitrary number assigned to an alternative, indicating the subjective value of that alternative relative to other choices. The utility of the reward for correct decisions on the expanded judgment task was determined for each subject. Utility was measured by the method employed by Coombs and Komorita.[2]

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[1] T. F. Pettigrew, "The Measurement and Correlates of Category Width as a Cognitive Variable," Journal of Personality, 1958, 26, 532-544.

[2] C. H. Coombs, S. S. Komorita, "Measuring Utility of Money Through Decisions," American Journal of Psychology, 1958, 71, 383-389.

Fear of failure.--Fear of failure refers to a motivational disposition to be anxiously concerned about avoiding failure.[1] The Mandler-Sarason Test Anxiety Questionnaire has been used to measure the strength of this motive.

Need to achieve.--The need to achieve refers to positive achievement-related motivation, which is a stable disposition to strive for success and was measured by use of the Thematic Apperception Test. The positive categories of the n-Achievement scoring system determine the need-to-achieve score.[2] These include achievement imagery, positive anticipations of success, positive emotional concomitants of achievement, external assistance for characters in an ongoing achievement activity, successful instrumental activity leading to achievement, and absence of a competing theme not related to achievement.

Information demand.--Information demand is the amount of information requested by the subject before he is willing to make a decision.

Expanded judgment task.--An expanded judgment task is a decision-making situation in which the subject has the opportunity to hold off making a final decision until he is ready. New information is presented and with each additional piece of information the subject must repeatedly make the choice to hold out for more information or come to a final decision. The judgment is not a one-step process but takes place over a period of time. The task was an adaptation of one designed by Irwin and Smith.[1] Subjects were able to look at cards one at a time, upon each of which was printed a positive or negative number, ranging in value from a -9 to a +9, including zero. The individual had to decide whether the mean of the deck of cards was greater than or less than zero.

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[1] J. W. Atkinson, "Motivational Determinants of Risk-Taking Behavior," Psychological Review, 1957, 64, 359-372.

[2] D. C. McClelland, J. W. Atkinson, R. A. Clark, and E. L. Lowell, The Achievement Motive, New York: Appleton-Century-Crofts, Inc., 1953.

Payoff.--Payoff refers to the experimental condition in which subjects are given a reward for correct solutions to the decisions in the expanded judgment task. Subjects are required to pay for information requested to make the decisions. They are not informed of the correctness of their decisions during the experiment. Non-payoff refers to the experimental condition in which subjects do not have to pay for information and do not receive a reward for a correct decision.

Hypotheses

1. Subjects will demand more information in a non-payoff situation than in a payoff situation prior to making a decision.
2. Broad categorizers will demand more information before making a payoff or non-payoff decision than narrow categorizers.
3. Subjects for whom the reward has greater utility will demand less information than subjects for whom the reward has less utility.
4. There will be no difference in the amount of information demanded

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[1] F. Irwin and W. A. S. Smith, "Further Tests of Theories of Decision in an Expanded Judgment Situation," Journal of Experimental Psychology, 1956, 52, 345-348.

prior to making a decision between high need-achievers and low need-achievers.

5. There will be no difference between those who have a high fear of failure and those who have a low fear of failure in the amount of information demanded prior to making a decision.
6. The need to achieve and fear of failure will interact to affect information demand in both a payoff and non-payoff decision situation.
   a. When compared to the group high in fear of failure and low in need achievement, subjects identified as high in need achievement and low in fear of failure will show the smaller deviation about the mean of the total sample in the amount of information demanded prior to making a decision.
   b. When compared to the group high in need achievement and low in fear of failure, subjects identified as high in fear of failure and low in need achievement will show the larger deviation about the mean of the total sample.
   c. Subjects who are high in need achievement and high in fear of failure will be equal in central tendency and variability to all the subjects in the total sample in the amount of information demanded prior to making a decision.
   d. Subjects who are low in need achievement and low in fear of failure will be equal in central tendency and variability to all the subjects in the total sample in the amount of information demanded prior to making a decision.

Delimitations

Subjects in the study were male students in urban high schools. Therefore, any generalizations that can be made must be limited to populations similar to the subjects in the study.

Need for the Study

Information gathering is an ingredient of most decision making. Individual differences in how much information is requested before a decision is made become particularly interesting when the acquisition of additional information is as costly as making the wrong decision. In many cases, the decision is a risk-taking situation in that the outcome of the decision cannot be predetermined. Therefore, either course of action involves a risk. Making a decision prematurely may result in error; additional information may be costly and not necessarily useful to making a best decision.

The implications of this type of inferential decision making for education and other areas are demonstrated through the following examples: The administrator of a school may be faced with the task of picking from among his employees the best suited to fill a vacant public relations position. Leaving the position vacant too long may create a public relations problem, but selecting from among his personnel without enough knowledge of the candidate's qualifications may create later problems for the administrator.

The student who is asked by his teacher to make inferences on the basis of class content has his ego and possible class grade at stake. If he is not sure and makes the inference based on little information, he risks being wrong. Being wrong or right may affect his grade, how he is viewed by his peers and how he sees himself. Holding out for more information before making an inference may also affect the student's self image as well as the teacher's perception of his capabilities. In addition, among students of the same ability level, the differences in the willingness to make inferences on limited information may determine the rate at which conceptual material is learned.

Researchers show their individual differences in their willingness to add to theory or scientific knowledge on the basis of experiment. Darwin gathered information for many years before he presented his theory of natural selection, whereas others will theorize and speculate in publications on the basis of one experience. Many experiments or observations increase the probability of an individual's being right but are costly in terms of time, energy and personnel involved. Conservatism in theoretical speculation can actually be a deterrent, in some instances, to the advancement of scientific knowledge.

The military commander is constantly faced with making a choice in strategy. His decision is based on the inferences he has made from limited information, and it involves risk. Holding out for too much information may result in the loss of lives as would a wrong decision based on too little information.

This study was initiated to examine variables contributing to individual differences in information demand during the decision-making process. Such a study was clearly needed as an important addition to theory.

Bruner[1] and Pettigrew[2] have identified through experiment and a paper-and-pencil situation, respectively, consistencies in the range of values individuals will assign to any one feature of the environment. When given the average dimension of a category, e.g., speed of bird in flight, some individuals will give the fastest and slowest speed a greater range of values than others. This person is the "broad categorizer."[3] The individual assigning the smallest range of values to the possible speeds of a bird in flight is the "narrow categorizer."[4] The broad categorizer prefers the risk of including as a member of a category one that does not belong, rather than exclude it. The other extreme, the narrow categorizer, includes those individuals who prefer to take the risk of excluding members of a category, rather than including those instances that do not belong. How category width relates to information-gathering behavior was examined in the study.

Kogan and Wallach have studied category width as a risk-taking dimension and have examined its relation to information-gathering behavior.[5] Individuals paid for information with money given them. Based on the amount of information requested, subjects were to decide whether the mean of a deck of positively and negatively numbered cards was either above or below zero. The correct answer rewarded them with the amount of money remaining. The researchers did take into account the increased ego involvement in a task in which there is an actual reward at stake, but did not consider the variation in value the reward had for each individual. The effect of internal variables on information gathering cannot be fully evaluated until the meaningfulness or value of the reward itself is controlled for. The assumption underlying the Kogan and Wallach experiment is that the monetary reward had the same value for all subjects. This study controlled for the possible variation in subjective value the reward had for individuals.

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[1] J. S. Bruner, J. J. Goodnow, and G. A. Austin, A Study of Thinking, New York: John Wiley & Sons, Inc. (Science Editions, Inc.), 1962.

[2] T. F. Pettigrew, "The Measurement and Correlates of Category Width as a Cognitive Variable," Journal of Personality, 1958, 26, 532-544.

[3] Ibid.

[4] Ibid.

[5] N. Kogan and M. A. Wallach, Risk Taking: A Study in Cognition and Personality, New York: Holt, Rinehart & Winston, 1964.

Another point to be noted in the Kogan and Wallach experiment is that quantitative ability was not controlled for. Subjects were required to infer the mean of a set of numbers from limited information; therefore, it is likely that those individuals who were more "comfortable" with mathematics might have demanded less information. The researchers worked with one of the two factors in the Category Width scale which was uncorrelated with quantitative ability, but this was not enough to assure that variability in behavior was not due to ability differences. This study controlled for quantitative ability, since the expanded judgment situation was similar to that used by Kogan and Wallach.

Brody studied the dimensions need achievement and test anxiety as they related to subjects' perceptions of their likelihood of success in a sequential decision experiment.[1] Subjects asked for cards one at a time until they were ready to decide how many squares the complete deck of cards contained. Brody did not require that subjects pay for information and only offered points as their reward for correctness. With this procedure, subjects have nothing at stake; they have nothing to lose or gain in reality. Their involvement in the experiment had to be assumed. This study offered an actual monetary reward to heighten motivation. Motivational variables such as fear of failure and the need to achieve may affect different behavior in situations in which risk is involved as opposed to those situations in which the individual has nothing to lose. In order to see whether or not this differential effect does occur, this study examined the effect of the need to achieve and fear of failure on information demand in an expanded judgment task under both payoff and non-payoff conditions.

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[1] N. Brody, "n-Achievement, Test Anxiety and Subjective Probability of Success in Risk-Taking Behavior," Journal of Abnormal and Social Psychology, 1963, 66, 413-418.

In addition, Brody's study was performed using college students as subjects. For college students, the need to achieve would be expected to be higher relative to the general population.[1] This study used high school students who were more likely to show a greater range of values for measured need achievement.

Students are inundated with pressures to make decisions, whether they are career decisions, or the day-to-day decisions necessary to learning conceptual material or solving problems. In order to help or train students to be more efficient decision-makers, it was an essential intent of the study to consider differences in the decision-making process, to understand the personality of individuals as it relates to a particular decision-making strategy.

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[1] J. Veroff et al., "The Use of Thematic Apperception to Assess Motivation in a Nationwide Interview Study," Psychological Monographs, 1960, 74, Whole No. 499.

CHAPTER II

BACKGROUND AND RELATED LITERATURE

Category Width

Pettigrew constructed and validated a scale which described a subject's style of responding to the average dimension of a category.[1] Individuals were asked to respond by giving the upper and lower limits of the category from among choices listed, e.g., subjects were presented with the average length of whales in the Atlantic Ocean, and then asked to select the lengths of the longest and shortest whale in the Atlantic Ocean.

The scores correlated significantly with quantitative aptitude and sex. The test was found to contain two orthogonal factors, one a quantitative, time-and-speed dimension, the other a more general dimension. This accounted for the high correlation with quantitative ability. The 218 males in the study obtained a mean category-width score eight points higher than that of 116 females. This difference was significant at the .001 level.

Pettigrew obtained the theoretical impetus for this work from the work of Bruner, who noted this same behavioral consistency in

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[1] T. F. Pettigrew, "The Measurement and Correlates of Category Width as a Cognitive Variable," _Journal of Personality_, 1958, _26_, 532-544.

individuals in concept formation.[1] Bruner noted that categorizing behavior was necessary for concept formation. Objects were identified for individuals by attributes which could take on a range of values. Some individuals used a broad range of values of an attribute to define the exemplar of a category whereas others used a narrow range of values. There appeared to be a preference for one of two types of error: either one of inclusion or exclusion. The individual who committed the error of inclusion used a broader range of values of attributes to define exemplars of categories. He preferred the risk of including as a member of a category one that did not belong, rather than to have excluded it. The other extreme included those individuals who preferred to take the risk of excluding members of a category, rather than to have included those instances that did not belong.

With 217 male and female undergraduates as subjects, Kogan and Wallach studied category width as one cognitive dimension to be related to decision-making behavior using test anxiety and defensiveness as moderator variables.[2] Subjects were exposed to two sequential decision-making situations in which a correct answer received a reward equal to the original offer less the amount paid for information requested. In the number judgments task,[3] adapted from Irwin and Smith,[4] subjects were asked to state whether the mean of a deck of numbered cards was greater than or less than zero. Cards were presented one at a time. Each card requested by the subject was paid for by him out of the possible reward money.

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[1] J. S. Bruner, J. J. Goodnow, and G. A. Austin, A Study of Thinking, New York: John Wiley and Sons, Inc. (Science Editions, Inc.) 1962.

[2] N. Kogan and M. A. Wallach, Risk Taking: A Study in Cognition and Personality, New York: Holt, Rinehart & Winston, 1964, pp. 146-151.

[3] Ibid., p. 29.

[4] F. Irwin and W. A. Smith, "Further Tests of Theories of Decision in an Expanded Judgment Situation," Journal of Experimental Psychology, 1956, 52, 345-348.

In the clues task,[1] adapted from Worley[2] and Roberts,[3] subjects identified four objects on the basis of requested information, receiving the money remaining as the reward for a correct answer. For both the number judgments and clues task, subjects were not told of the correctness of their decision until the end of the experimental session. The researchers found that for males, the correlations between category width and information demanded in both decision-making tasks clustered around zero.[4] For the total female group (N=103), a correlation of .26 ($p < .01$) was obtained between category width and information demanded prior to making a decision. The highest correlations were found for females who were low in test anxiety and high in defensiveness.

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[1] Kogan and Wallach, op. cit., p. 30.

[2] D. R. Worley, "Amount and Generality of Information-Seeking Behavior in Sequential Decision-Making as Dependent on Level of Incentive," in D. W. Taylor (ed.), Experiments on Decision Making and Other Studies. Arlington (Va.): ASTIA, 1960 (Technical Report No. 6, AD 253952) pp. 1-11.

[3] J. S. Roberts, Jr., "Information-Seeking in Sequential Decision-Making as Dependent Upon Test Anxiety and Upon Prior Success or Failure in Problem Solving," in D. W. Taylor (ed.), Experiments on Decision-Making and Other Studies. Arlington (Va): ASTIA, 1960 (Technical Report No. 6, AD 253952) pp. 26-37.

[4] Kogan and Wallach, op. cit., pp. 146-151.

Category width has been reported by Pettigrew[1] and Kogan and Wallach[2] to be composed of two factors, one of which was found to be significantly correlated with mathematical aptitude.

Utility

Theory

The concept of utility did not have a mathematical beginning. It arose out of the Utilitarian theory espoused by Jeremy Bentham and James Mill, economists showing the hedonistic influence.[3] The theory described the goal of human action as the striving for pleasure and the avoidance of pain. The object of a man's action or the action itself was considered to have pleasure or pain-giving properties. The properties described were called the utility of the object. Since pleasure was considered positive utility, and pain was associated with negative utility, the goal of human action was to have the greatest pleasure or maximum positive utility.

Daniel Bernoulli was identified with the mathematical development of utility in decision models.[4] This was later echoed and brought further conceptually by Von Neumann and Morgenstern.[1] They were concerned with the determinants of choice among different courses of action. Their decision models viewed the decision maker as one who compared the products of different courses of action available to him by considering the utilities of the products and the probabilities of their occurrence. The course of action for which the probability-value product was largest became the one selected.

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[1] T. F. Pettigrew, "The Measurement and Correlates of Category Width as a Cognitive Variable," Journal of Personality, 1958, 26, 532-544.

[2] Kogan and Wallach, op. cit., p. 146.

[3] W. Edwards, "The Theory of Decision Making," Psychological Bulletin, 1954, 51, 380-417.

[4] W. Edwards, "Behavioral Decision Theory," Annual Review of Psychology, 1961, 12, 473-498.

If an individual were to make a choice between two objects, A and B, and he were to choose B, it is assumed that the utility function of B is higher than A. What is created is an ordinal scale in which objects are ranked according to the value given them by the individual. If the individual were to choose white wine over red wine, the white wine is considered to have greater value for him and therefore to have greater utility. Money may not necessarily have value to an individual consistent with its monetary value. For example, 50 dollars will not have the same value to a person of meager income as it would to a millionaire. As a result, an object may not only have objective value (considered in terms of monetary worth) but can also have subjective value (considered in terms of personal taste). It is the subjective value of an object that is considered its utility.

In a choice situation the probability of an event occurring must also be taken into account. What determines man's decision depends not only on the value of the object or event but also on the likelihood of its occurrence.[1,2] People's view of the likelihood of an event does not necessarily agree with objectively stated probabilities. The individual's view of probability is termed the subjective probability.

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[1] J. Von Neumann, and O. Morgenstern, Theory of Games and Economic Behavior, New York: (Science Editions) John Wiley & Sons, Inc., 1964.

The variables that have been considered in most decision theory models have been the subjective value of an object (utility), and either its subjective or objective probability of occurrence.

Measurement

With all that has been written about utility theory, relatively little has been done in the development of means to measure the utility of an object.

Individuals were perceived through decision models to select an alternative giving the highest expected utility. The value of the expected utility was dependent upon the summation of the probability-utility products. As a result, attempts to measure the utility of an object would most often control for probability. Mosteller and Nogee devised a gambling experiment to arrive at a measure of utility.[3] Subjects were put into a gambling situation in which the probabilities of winning were known. If an individual were indifferent between taking and not taking a gamble with a stake of five cents and a probability *p* of winning an

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[1] Edwards, op. cit.

[2] P. C. Fishburn, Decision and Value Theory, New York: John Wiley & Sons, Inc., 1964, pp. 1-17.

[3] F. Mosteller, and P. Nogee, "An Experimental Measurement of Utility," Journal of Political Economics, 1951, 59, 371-404.

amount A, then:[1]

$$pU(A) + (1 - p)U(-5 \text{ cents}) = U(0)$$

If U(- 5 cents) = -1, and U(0) = 0, then one could solve for U(A). This was permissible, since the origin and unit size were arbitrary. This was done for each amount to be won (A) by varying the probability (p) of its occurrence until the subject was indifferent to the two alternatives. The experimenters assumed that individuals act subjectively in accordance with objective probabilities.

Whereas Mostellar and Nogee controlled for objective probabilities, Davidson, Suppes, and Siegel developed a way to measure utilities while controlling for subjective probabilities.[2] Their procedure for doing this was first to isolate an event whose subjective probability was 1/2. This was determined by finding an event E such that the individual was indifferent to 1) receiving an amount of money a when E occurred and b when E did not occur, or 2) receiving an amount b when E occurred and a when E did not occur. In this case a and b were amounts of money for which the assumption was made that the individual always preferred a greater amount of money. A person would only have been indifferent if the probability were 1/2.

Once E was determined, its subjective probability being 1/2, the preference between gambles on the occurrence of E could be established.

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[1] The letter U is the symbol for utility so that U(0) is read: the utility of zero. The notation $_pU(A)$ is read: the probability of winning an amount A multiplied by the utility (value) of amount A.

[2] D. Davidson, P. Suppes, and S. Siegel, Decision-making: An Experimental Approach, Stanford: Stanford University Press, 1957.

The utility function for money could then be traced out with a limited number of observations; and predictions to other choices could be made.

The method of measurement of utility, used by Coombs and Komorita, was that used by the author. Coombs and Komorita, using three subjects, performed an experiment to measure the utility of money, holding probability constant.[1] They held the view that the preferential choice between two bets implied an order relation between two intervals on a utility scale. The example they cited involved the following two bets:

	Heads	Tails
Bet A:	win \$5	lose \$5
Bet B:	win \$6	lose \$6

The subject was asked to choose between these two bets. The flip of an unbiased coin determined his winning or losing in each case. The theory presented by the authors stated that the subject would have preferred bet *A* to *B* if, and only if, the dollar between losing \$5 and \$6 were a greater interval in utility than the dollar between winning \$5 and winning \$6. Alternately, if the dollar between winning \$5 and winning \$6 were a greater interval in utility than the interval between losing \$6 and losing \$5, he would have preferred bet *B* to *A*.

The method of triads was used.[2] Subjects were asked to indicate the bet they most preferred and the bet they least preferred. The unfolding technique, developed by Coombs, was then used to obtain metric relations.[1]

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[1] C. H. Coombs and S. S. Komorita, "Measuring Utility of Money Through Decisions," *American Journal of Psychology*, 1958, *71*, 383-389.

[2] J. P. Guilford, *Psychometric Methods*, New York: McGraw-Hill Book Company, Inc., 1954, pp. 192-193, 248-250.

Need to Achieve and Fear of Failure

Theory

McClelland, and others, through the experimental arousal of specific motivational states, attempted to measure the effect of human motives on imagination and fantasy.[2] Subjects were presented the pictures of the Thematic Apperception Test (TAT) on a screen and were asked to respond within a time limit. By comparing the nature of the responses of subjects under stress conditions with those under relaxed conditions, McClelland and his co-workers were able to obtain a reliable measure of the need to achieve.

It was McClelland and Liberman who first proposed that the extremes of the continuum of need-achievement scores could be viewed as the expression of two different needs: the need to achieve and fear of failure.[3] They found that subjects who were low in need-achievement scores showed evidence of perceptual defense when presented with words related to failure.

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[1] C. H. Coombs, Theory of Data, New York: John Wiley & Sons, Inc., 1964, pp. 80-121.

[2] D. C. McClelland et. al., The Achievement Motive, New York: Appleton-Century-Crofts, Inc., 1953.

[3] D. C. McClelland and A. M. Liberman, "The Effect of Need for Achievement on Recognition of Need-Related Words," Journal of Personality, 1949, 18, 236-251.

In his discussion of gambling behavior, Cohen hypothesized the existence of two types of people: one who focused on the possibilities of success, ignoring the possibilities of failure and the other who expressed himself in terms of finding the fewest possibilities of failure.[1] But his conjectures were left at that and were not followed up by experiment.

Experiments by various researchers showed definite behavioral differences between subjects high in the need to achieve and low in the need to achieve. McClelland related the need-achievement scores of children to their risk-taking behavior as measured by tasks such as ring toss.[2] The high need achievers tended to take all their shots from intermediate distances whereas the low need achievers tended to throw the rings from very close or very far distances. What McClelland; Clark, Teevan and Ricciuti;[3] and Litwin[4] have shown experimentally, Atkinson has shown mathematically: that the motivation to achieve was highest when the individual was most uncertain about the outcome.[5] That is to say that intermediate distances in a ring toss game were distances that allowed the participant a 50-50 chance of succeeding. For individuals having a high need to achieve, a probability of success equal to .50 was the most desirable in terms of his value of success.

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[1] J. Cohen, Behavior in Uncertainty, New York: Basic Books, Inc., 1964.

[2] D. C. McClelland, "Risk Taking in Children with High and Low Need for Achievement," in J. W. Atkinson (ed.), Motives in Fantasy, Action and Society, New York: D. Van Nostrand Company, Inc., 1958, pp. 306-321.

[3] R. Clark, R. Teevan, and H. Ricciuti, "Hope of Success and Fear of Failure as Aspects of Need for Achievement," Journal of Abnormal and Social Psychology, 1956, 53, 182-186.

[4] G. H. Litwin, "Achievement Motivation, Expectancy of Success, and Risk-Taking Behavior," in J. W. Atkinson and N. T. Feather (eds.), A Theory of Achievement Motivation, New York: John Wiley & Sons, Inc., 1966, pp. 103-115.

[5] J. W. Atkinson, "Motivational Determinants of Risk-Taking Behavior," Psychological Review, 1957, 64, 359-372.

In his discussion of achievement motivation Atkinson pointed out that the strategy an individual took in an achievement situation was dependent upon the additive combination of the individual's tendency to approach success and tendency to avoid failure. Each one of these tendencies was in turn determined by the multiplicative combination of the need to succeed or fear of failure, the probability of success or probability of failure, and the value of success or value of failure. Even though Atkinson's discussion focused directly on the area of achievement motivation, the concepts of probability of achieving a goal and utility of the goal as determinants of behavior were similar to those used in decision theory models.

The attractiveness of a specific goal was seen to be inversely related to the probability of obtaining it. In other words, people more fully appreciate reaching what appears to be the unattainable. For example, society has always given greater status to those professions which one would find more difficult to enter. Escalona,[1] and Festinger[2] validated this inverse relation in their studies on level of aspiration; Mahone reinforced it more fully in his study of vocational choice.[1]

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[1] S. K. Escalona, "The Effect of Success and Failure Upon the Level of Aspiration and Behavior in Manic-Depressive Psychoses," University of Iowa Studies of Child Welfare, 1940, 16, 199-302.

[2] L. Festinger, "A Theoretical Interpretation of Shifts in Level of Aspiration," Psychological Review, 1942, 49, 235-250.

It is within this theoretical framework that Atkinson would explain the behavior of the children in the ring toss game.[2] When the probability was 50-50, the greatest uncertainty of success existed and children high in the need to achieve were most motivated. A probability of success equal to .50 only made the children low in the need to achieve very anxious. In order to defend themselves against this anxiety, they would select distances that gave them either a very high or low probability of making a ringer. Close distances allowed them almost sure success whereas great distances allowed them to miss without embarrassment, for who would expect anyone to accomplish so difficult a feat.

Measurement

Research that has used the need to achieve as a variable to be studied, whether it be in relation to persistence,[3] level of aspiration,[4] probability preference,[5] risk taking,[6] economic behavior,[1] or academic performance,[2] has used the measure of achievement motivation developed by McClelland.[3] As discussed previously, the measure was obtained by scoring subjects' responses to TAT pictures for any achievement-related content.[4]

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[1] C. H. Mahone, "Fear of Failure and Unrealistic Vocational Aspiration," Psychological Review, 1942, 49, 235-250.

[2] Atkinson, op. cit.

[3] N. T. Feather, "The Relationship of Persistence at a Task to Expectation of Success and Achievement-Related Motives," Journal of Abnormal and Social Psychology, 1961, 63, 552-561.

[4] R. W. Moulton, "Effects of Success and Failure on Level of Aspiration as Related to Achievement Motives," Journal of Personality and Social Psychology, 1965, 1, 399-406.

[5] L. W. Littig, "Effects of Motivation on Probability Preferences," Journal of Personality, 1963, 31, 417-427.

[6] J. W. Atkinson, "Motivational Determinants of Risk-Taking Behavior," Psychological Review, 1957, 64, 359-372.

Studies have shown females to have a high need-to-achieve score under relaxed conditions, therefore, not showing any significant increase in score under achievement-oriented conditions.[5,6] As a result, this difficulty has caused most studies to be performed with male subjects.

Clark, Teevan and Ricciuti tried to validate previous research which suggested that the TAT measured both hope of success and fear of failure.[7] They used level of aspiration as another measure of these dimensions. Their results showed the high need-achievement group to have scored more in deprivation imagery on the TAT than the fear-of-failure group. This indicated that the TAT, by itself, could not be used as a measure of the motive to avoid failure.

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[1] J. N. Morgan, "The Achievement Motive and Economic Behavior," Economic Development and Cultural Change, 1964, 12, 243-267.

[2] C. P. Smith, "The Influence of Testing Conditions on Need for Achievement Scores and Their Relationship to Performance Scores," in J. W. Atkinson and N. T. Feather (eds.), A Theory of Achievement Motivation, New York: John Wiley & Sons, Inc., 1966, pp. 277-297.

[3] D. C. McClelland et al., The Achievement Motive, New York: Appleton-Century-Crofts, Inc., 1953.

[4] McClelland, op. cit., pp. 139-160.

[5] J. Veroff, S. Wilcox, and J. W. Atkinson, "The Achievement Motive in High School and College Age Women," Journal of Abnormal and Social Psychology, 1953, 48, 108-119.

[6] E. G. French, and G. S. Lesser, "Some Characteristics of the Achievement Motive in Women," Journal of Abnormal and Social Psychology, 1964, 68, 119-128.

[7] R. Clark, R. Teevan, and H. Ricciuti, "Hope of Success and Fear of Failure as Aspects of Need for Achievement," Journal of Abnormal and Social Psychology, 1956, 53, 182-186.

Because of the questionable results and difficulties in interpretation of the Clark study, researchers have used another instrument to measure fear of failure which has shown statistical independence from the TAT measure of need achievement.

Raphelson found that scores on the Mandler-Sarason Scale of Test Anxiety were positively correlated with the psychogalvanic skin response which was already known to be an experimentally effective measure of anxiety.[1] But at the same time he found the TAT need-achievement scores to correlate -.43 with test anxiety, which certainly was no evidence for their independence.

In an experiment to determine the construct validity of various measures of achievement-related motives, Atkinson and Litwin used the Mandler-Sarason Test Anxiety Questionnaire as the measure of fear of failure.[2] The correlation obtained between the need-to-achieve scores and test anxiety scores was -.15, which was not significant. The researchers explained the variance in their results from that of Raphelson as a result of testing conditions. Raphelson had administered the TAT measure of need achievement under stress conditions whereas Atkinson and Litwin administered the projective measure under neutral conditions. According to a study reported by Scott, subjects who were both high in the need to achieve and high in fear of failure inhibited achievement-related imagery when put in an anxiety provoking situation.[1] Atkinson and Litwin saw this as an explanation for the different correlations. Subjects in Raphelson's experiment who might have been high in need achievement as well as high in fear of failure under neutral conditions obtained lower scores in need achievement under stress conditions thereby producing a higher negative correlation between the two measures.

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[1] A. C. Raphelson, "The Relationship Between Imaginative, Direct, Verbal, and Physiological Measures of Anxiety in an Achievement Situation," Journal of Abnormal and Social Psychology, 1957, 54, 13-18.

[2] J. W. Atkinson and G. H. Litwin, "Achievement Motive and Test Anxiety Conceived as Motive to Approach Success and Motive to Avoid Failure," Journal of Abnormal and Social Psychology, 1960, 60, 52-63.

Even though the concept of fear of failure arose out of McClelland's work with the TAT as a measure of achievement-related motives, the instrument used and validated most often in contemporary research to measure the fear of failure dimension is the Mandler-Sarason Test Anxiety Questionnaire.

Information Demand

Research has shown that in a situation of uncertainty individuals varied and were consistent in the amount of information they required to make a decision. Some individuals seemed to need to confirm their tentative hypotheses a number of times before they risked a decision, whereas others appeared to be willing to take greater risks in inference making.

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[1] W. A. Scott, "The Avoidance of Threatening Material in Imaginative Behavior," Journal of Abnormal and Social Psychology, 1956, 52, 338-346.

Westcott studied the inference making behavior of individuals in situations in which the relation between the evidence available and conclusions was not clear. He identified this special kind of inference making as "intuitive leap."[1] The results indicated that there were stable individual differences in the amount of information subjects required before they attempted a solution and this had no significant relation to reaching an accurate conclusion.

In a study by Edwards and Slovic, subjects were asked to find the unique cell in a 16-cell matrix.[2] Each cell they wrote in they were required to pay for, with discovery of the unique cell bringing a monetary payoff. The method used did allow for feedback. The unique cell was found by using a pencil on a punchboard covered with foil. Examining the cell meant writing a letter in it. The foil gave way at the unique cell. By use of slight pressure it was possible to tell whether or not one had the unique cell without making an identifiable mark. Each person worked on his own and the number of cells tried was indicated by the number of cells marked. It was found that subjects were usually consistent in being cautious or incautious.

Using information demand as an analog to decision time, Irwin and Smith designed an experiment to determine whether there was any relation between decision time and magnitude of stimulus difference.[3]

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[1] M. R. Westcott, "On the Measurement of Intuitive Leaps," Psychological Reports, 1961, 9, 267-274.

[2] W. Edwards and P. Slovic, "Seeking Information to Reduce the Risk of Decisions," American Journal of Psychology, 1965, 78, 188-197.

[3] F. Irwin and W. A. S. Smith, "Further Tests of Theories of Decision in an 'Expanded Judgment' Situation," Journal of Experimental Psychology, 1956, 52, 345-348.

Subjects were required to determine whether the mean of a deck of cards was greater or less than zero using as few clues as possible. Their results showed large and consistent individual differences in the amount of information demanded prior to making a decision. They also found that the amount of information was related to the variability of information presented them. In other words, individuals required to make a decision demanded more information when the information indicated greater contradiction.

Payoff

Making decisions in the real world, decisions which have no assured outcome, is a risk. Situations in which subjects have some kind of investment elicit different kinds of behavior from individuals than those situations in which subjects have nothing at stake. On this latter point research seems to agree.

McClelland and his co-workers, when measuring the effects of needs on fantasy and imagery, recognized the necessity to create experimentally a situation in which there was ego-involvement.[1] Kogan and Wallach have pointed out that if the research situation is seen as a game, subjects will not view any of their own behavior as risk-taking, thereby limiting the researchers' possibilities for generalization.[2]

An indication of the effect of incentive on decision making was demonstrated in an experiment by Irwin and Smith.[1] They found that the number of clues demanded by subjects prior to making a decision increased with the value of money prizes for correct decisions and decreased with increased money cost per clue.

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[1] D. C. McClelland, R. A. Clark, T. B. Roby, and J. W. Atkinson, "The Projective Expression of Needs. IV. The Effect of the Need for Achievement on Thematic Apperception," Journal of Experimental Psychology, 1949, 39, 242-255.

[2] N. Kogan and M. A. Wallach, "Risk Taking as a Function of the Situation, the Person, and the Group,: in New Directions in Psychology III, New York: Holt, Rinehart & Winston, 1967, p. 186.

Summary

Research has shown the correlation between category width and information demand to be .26 ($p < .01$) for females and around zero for males.[2] A number of factors may have caused this. The relation between category width and information demand for males may have been curvilinear, therefore producing a low correlation. This study determined whether or not this was so. In addition, mathematical skill should have been controlled for in any study using the Irwin and Smith clues task,[3] since the ability to estimate means may have cancelled out any existing relation between category width and information demand. This study controlled for mathematical ability.

In order to simulate real life conditions, and in recognition of the necessity to have subjects take laboratory experiments seriously, studies have used monetary rewards for correct decisions. Yet in order to assess the strength of specific internal variables as determinants of information gathering behavior it is necessary to control the effects of extraneous factors contributing to the apparent differences in behavior. The assumption behind experiments using money as extrinsic motivation to elicit intrinsic motivational variables is that money has equal value to all subjects. Research has shown that the subjective value or utility of objects varies from individual to individual and from time to time. This study determined the utility of the reward for each individual immediately prior to the experimental conditions thereby controlling for its contribution to the variance in individual behavior.

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[1] F. Irwin and W. A. S. Smith, "Value, Cost and Information as Determiners of Decision," Journal of Experimental Psychology, 1957, 54, 229-232.

[2] N. Kogan and M. A. Wallach, Risk Taking: A Study in Cognition and Personality, New York: Holt, Rinehart & Winston, 1964, pp. 146-151.

[3] F. Irwin and W. A. S. Smith, "Further Tests of Theories of Decision in an 'Expanded Judgment' Situation," Journal of Experimental Psychology, 1956, 52, 345-348.

The need to achieve, measured by the TAT, and fear of failure, measured by the Mandler-Sarason Scale of Test Anxiety, have been related in experimental studies to risk-taking behavior. Research has shown that individuals high in the need to achieve and low in fear of failure preferred situations in which the probability of success was equal to .50. Subjects scoring high in fear of failure and low in need achievement became very anxious in these situations and dealt with their anxiety by strategies in behavior that gave them a high or very low probability of success. With a high probability of success, goal attainment was almost certain; whereas with a low probability of success, failure was almost certain. This did no damage to their self-image since no one could be expected to accomplish so difficult a task.

This study determined the influence of the need to achieve and fear of failure on information gathering behavior when subjects made decisions under conditions of risk. This new situation provided the opportunity to note whether the motivating effect of these variables was consistent over different achievement tasks.

Since category width has been viewed as a risk-taking dimension, it was of interest to determine whether any relation exists in individuals between this variable and the need to achieve and fear of failure. The present investigation provided a useful addition to theory by attempting to relate these theoretical constructs.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

The Sample

One hundred and sixty-eight male students who were in their junior year of the New York City public high schools served as subjects for this study. Only male subjects were used in order to control for the effect of sex differences on the dependent variable. Students were informed that they would receive $1.50 per hour for taking part in a study and that they could possibly earn additional money in the experiment. All subjects who volunteered and who met the criteria for the study became participants in the experiment. Complete data were collected for all subjects.

Subjects were classified as either high, medium or low on each of the variables: category width, fear of failure, need to achieve and utility of reward. Approximately 20 percent of the subjects falling in the middle of each classification were eliminated from the analysis of that dimension. The scores of all subjects were used in the correlational analyses.

Measuring Instruments

Measurement of Category Width

The Category-Width scale was used to measure the category width dimension.[1] The test requires the subject to respond to the average dimension of a category, e.g., speed of bird in flight, by selecting from among choices given the highest and lowest measure for that category, e.g., fastest speed of bird in flight and slowest speed of bird in flight. Those subjects who give the widest range of values are considered broad categorizers. Correspondingly, those subjects who give the smallest range of values are described as narrow categorizers. The 20-item scale has a reported over-time reliability of .72 (Spearman-Brown corrected coefficient), based on odd and even-item forms.[2] When the reliability was computed on odd-even items for subjects responding to all items at one testing, the internal consistency was reported to be .90 (Spearman-Brown corrected coefficient). The scale was reported to contain two factors, one of which is correlated with quantitative ability. The maximum possible score is 120.

The mean and standard deviation of scores obtained on all 20 items were computed and are reported in the results section. Those subjects scoring .25 of a standard deviation or more above the mean were considered broad categorizers; those subjects scoring .25 of a standard deviation or more below the mean were considered narrow categorizers.

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[1] T. F. Pettigrew, "The Measurement and Correlates of Category Width as a Cognitive Variable," Journal of Personality, 1958, 26, 532-544.

[2] Ibid.

Measurement of the Utility of Reward

The subjective value of the reward for subjects was determined by the use of a method employed by Coombs and Komorita,[1] and Siegel.[2] The subject was presented with a paper-and-pencil risk situation. The utility of money was measured while the probability of winning was held constant at .50; the expected utility was also held constant within any series of bets. Each item required the students to select the most preferred and least preferred bet from among three bets. Every bet had an amount to be won and an amount to be lost.

The unfolding technique in one dimension was used to develop an ordered metric scale for each person.[3] A score representing the relative value of $5 for each individual was computed. The highest possible score was 25. A mean and standard deviation were computed for the entire group. If an individual scored .25 of a standard deviation or more above the mean he was considered high in the utility of reward. Subjects scoring .25 of a standard deviation or more below the mean were considered low in the utility of reward.

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[1] C. H. Coombs and S. S. Komorita, "Measuring Utility of Money Through Decisions," American Journal of Psychology, 1958, 71, 383-389.

[2] S. Siegel, "A Method for Obtaining an Ordered Metric Scale," Psychometrika, 1956, 21, 207-216.

[3] C. H. Coombs, A Theory of Data, New York: John Wiley & Sons, Inc., 1964, 80-121.

Measurement of the Need to Achieve

A group form of the TAT, administered under neutral conditions, and scored according to a method devised by McClelland, et al., was used to measure the strength of the need to achieve.[1] Four cards, projected on a screen one at a time, provided the stimuli to which subjects responded by answering four open-ended questions about the meaning of the content. The content was scored on achievement-related imagery in 15 categories, with positive categories given a score of +1 each and negative categories given a score of -1 each. The higher the score over the four pictures, the higher the subject was in the need to achieve. Scores on each picture can range from -1 to +11. Scores for each subject were totalled over four pictures. Four points were added to each subject's total score to eliminate negative numbers.

The TAT slides projected on the screen were: 1) two inventors in a shop 2) boy in a plaid shirt with his hand on his forehead 3) scientist working with laboratory equipment 4) man sitting at a typewriter.

The product-moment correlation between scores obtained on two scorings of the need-achievement protocols was reported by both McClelland and Atkinson as .95.[2] The product-moment correlation between two forms of the group TAT has been reported to be .64 for 32 subjects. The estimated reliability of the measure obtained in response to six pictures (N=32) obtained by applying the Spearman-Brown correction formula was .78.[3]

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[1] D. McClelland, J. W. Atkinson, R. A. Clark, and E. L. Lowell, The Achievement Motive, New York: Appleton-Century-Crofts, Inc., 1953

[2] Ibid., pp. 185-186

[3] Ibid., p. 191.

The protocols for this study were scored by professional scorers who have been trained to achieve scoring reliabilities above .85.[1]

The mean and standard deviation were computed for the entire group. Those subjects scoring .25 of a standard deviation or more above the mean were described as high in the need to achieve; those subjects scoring .25 of a standard deviation or more below the mean were considered low in the need to achieve.

Measurement of Fear of Failure

The Mandler-Sarason Test Anxiety Questionnaire was used to measure fear of failure.[2] The test consists of 52 items which contain statements, in the first person, about reactions to testing situations. Below each statement is a line which represents the continuum of feelings associated with the statement. The extremes are labeled with opposing feelings, e.g., do not feel confident, feel confident, whereas the midpoint is labeled midpoint. The individual is asked to respond by putting an X at that point on the line which best indicates his strength of feeling. In scoring, each line is marked off into nine intervals. The score depends upon the interval in which the X falls. The interval at the low anxiety end of the scale is scored 1, the next one a score of 2, and so on until the highest interval, which is scored 9. The higher the score, the higher the subject's fear of failure.

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[1] Motivational Research Group, Behavioral Science Center; Cambridge Mass.

[2] G. Mandler and S. B. Sarason, "A Study of Anxiety and Learning," Journal of Abnormal and Social Psychology, 1952, 47, 166-173.

The split-half reliability (odd vs. even questions) of the anxiety questionnaire was reported to be .91 (Spearman-Brown correction).[1] The mean and standard deviation of scores was computed for all subjects. Those subjects scoring .25 of a standard deviation or more above the mean were considered high in the fear of failure; those subjects scoring .25 of a standard deviation or more below the mean were considered low in fear of failure.

Measurement of Information Demand

The expanded judgment task which is an adaptation of the one designed by Irwin and Smith was used to measure the dependent variable, information demand.[2] Each item simulates on a punchboard a deck of positively and negatively numbered cards for which the subject must decide if its mean were above or below zero. The task then becomes a risk situation in which the objective probability of success is constant and is .50. The subject is presented with cards, (numbers on a punchboard covered with aluminum foil which must be broken with a stylus), one by one, until he is ready to make the decision. A correct decision on each item brings the highest possible reward of one dollar. There are five items, or five decks of cards. Each clue requested costs the subject two cents, thereby reducing the possible reward. The first clue is free. There are a total of 51 possible clues available on each item, but the complete deck is indicated as having 100 cards. Subjects are not told whether or not their decisions are correct. This is to control for the possible effect of feedback of success or failure on future items.

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[1] Ibid., p. 168.

[2] F. Irwin and W. A. S. Smith, "Further Tests of Theories of Decision in an 'Expanded Judgment' Situation." Journal of Experimental Psychology, 1956, 52, 345-348.

The numbers for the cards were randomly selected so that the means of the decks of cards were not significantly different from each other ($F=0.96$, $p > .05$); research has indicated that variability in information presented will affect the amount of information requested.[1] The sequence of clues within each deck was the same for all subjects, so that differences in decisions at a specific point in the sequence of clues were not due to the information presented but to individual differences.

The score for each item was the number of clues demanded. This was summed over five items. Each subject's score was the mean number of clues demanded.

The expanded judgment task was also administered with no reward for a correct decision and no cost for information. Each subject took both forms of the task under both conditions.

Measurement of Numerical Ability

The Numerical Ability subtest of the Differential Aptitude Tests was used to measure students' numerical ability.[2] Since the expanded judgment task involved the averaging of numbers, students' numerical abilities were necessarily controlled for by use of scores on the Numerical

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[1] Ibid., p. 347.

[2] Differential Aptitude Tests (Form L) Manual, New York: The Psychological Corporation, 1963.

Ability subtest as a covariate.

The subtest consists of forty numerical problems, not framed in verbal terms. There are no reported reliability coefficients for Form L of the test battery, but reliabilities for the two previous forms (A and B) which are similar in item content are given in the manual. The reported reliability coefficient of the Numerical Ability subtest for males in grade eleven is .93 (with Spearman-Brown correction).[1]

Testing Procedure

The testing was conducted in the spring and summer of 1969, either after school hours or on the weekends, off the school premises. Students were informed by their teachers that a study of decision making was being conducted for which subjects would be paid $1.50 per hour. Interested students were asked to sign up so that adequate preparations could be made to accommodate the number to be tested. The size of the groups tested ranged from six to fifty-five. Each subject took all the tests during one session, lasting about three hours.

Subjects were told at the testing session that the results of the tests would in no way affect their grades in school. The importance of trying their best was emphasized. Subjects were also told that they would individually receive a summary of the results when the study was completed.

In order to eliminate the possibility of any order effects, all tests were administered in the same sequence for all subjects, except for the two information demand tasks; payoff and non-payoff. Subjects were assigned at random to performing the information demand task with no reward either before or after the information demand task with a reward. The order of the tests administered were as follows: a) Test Anxiety Questionnaire b) Numerical Ability subtest of the Differential Aptitude Tests c) Category-Width scale d) Thematic Apperception Test e) Information Demand-A with no reward or Information Demand-B with a reward f) Utility of Reward g) Information Demand-B with a reward or Information Demand-A with no reward.

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[1] Ibid., p. 66.

Prior to the administration of the tests, each subject was asked to fill out a form giving his name and address so that the total wages and money earned in the experiment could be sent to him in the form of a money order.

All testing materials were passed out face down. Subjects were informed not to turn over the test booklets until they were given directions to do so. For each test the experimenter read the instructions aloud slowly while the subjects read to themselves. Questions were asked for; when subjects appeared to understand the procedure they were told to begin.

Only one test did not have the instructions printed on the test booklet or on a separate sheet. The test for the need to achieve required oral directions. They were as follows:

> This is a test of your creative imagination. A number of pictures will be projected on the screen before you. You will have twenty seconds to look at the picture and then about four minutes to make up a story about it. Notice that there is one page for each picture. The same four questions are asked. They will guide your thinking and enable you to cover

> all the elements of a plot in the time allotted. Plan to spend about a minute on each question. I will keep time and tell you when it is about time to go on to the next question for each story. You will have a little time to finish your story before the next picture is shown.
>
> Obviously there are no right or wrong answers, so you may feel free to make up any kind of a story about the pictures that you choose. Try to make them vivid and dramatic; for this is a test of creative imagination. Do not merely describe the picture you see. Tell a story about it. Work as fast as you can in order to finish in time. Make them interesting. Are there any questions? If you need more space for any question, use the reverse side.

The room was then darkened for 20 seconds while the first picture was projected on a screen before the subjects. After 20 seconds the picture was turned off, the lights were turned on, and the subjects began writing. Time was kept, and after a minute was allowed for each question, the experimenter said:

> All right, it is about time to go on to the next question.

When the subjects had been writing for 30 seconds on the last question, the experimenter said:

> Try to finish up in 30 seconds.

At the end of the final minute, the next picture was prepared for, with no more time allowed than 15 seconds more than the required time for finishing the stories. The lights were dimmed and the next picture was projected on the screen for 20 seconds, and so on without interruption until all four stories had been written.

Treatment of the Data

Preliminary Analyses

The Relationship Between Aptitude and the Dependent Variables

Since the dependent variable required that the subjects determine the average of a group of numbers, the possible influence of numerical ability had to be predetermined in order to control for its contribution to variability in performance. Where significant relationships were found between numerical ability and the dependent variable in either the payoff or non-payoff situation, numerical ability was controlled for statistically.

Differences in Size of Groups Identified as High and Low on Independent Variables

Since perfect normal distributions of values were not obtained on all measures of the independent variables, division into high and low groups on the basis of .25 standard deviations distance from the mean did not result in equal numbers of subjects in each group. Chi square values were computed to determine whether or not the differences in the numbers of subjects in the high and low categories of the independent variables departed significantly from chance differences. Non-significant chi square values indicated that the analyses between groups could be performed with unequal *n*'s.

Tests of the Hypotheses

Hypothesis 1

Hypothesis 1 states that subjects will demand more information in a non-payoff situation than in a payoff situation prior to making a decision.

Numerical ability was found to be correlated significantly with information demand in a payoff situation and nonsignificantly in a non-payoff situation, therefore, it was not used as a covariate and an analysis of variance of a 2 x 2 Latin-square design was performed to test the hypothesis. The subjects were assigned at random to the two different orders of presentation of the payoff and non-payoff treatments. The dependent variable in both cases was the amount of information demand prior to making a decision. Payoff and non-payoff presentation of the expanded judgment task were the independent variables.

The hypothesis would be supported if a significant difference in information demand was found between the two experimental conditions, payoff and non-payoff, in the direction of non-payoff. A difference was considered significant at the .05 level.

Hypothesis 2

Hypothesis 2 states that broad categorizers will demand more information before making a payoff or non-payoff decision than narrow categorizers.

The correlation (Pearson-product moment) between category width and information demand was computed for both the payoff and non-payoff situation. Non-significant correlations were followed by the computation of the correlation ratio, to determine whether or not the relation was curvilinear. The discrepancy between η_{yx}^2 (correlation ratio) and r^2 was used as a measure of nonlinearity of regression.[1]

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[1] G. A. Ferguson, Statistical Analysis in Psychology and Education (2nd Edition), New York: McGraw-Hill Book Company, Inc., 1966, 246-249.

Two analyses were performed. A one-way analysis of variance was performed for the non-payoff situation, with category width as the independent variable and information demand as the dependent variable. Numerical ability was not controlled for since it did not correlate with the dependent variable.[1]

A one-way analysis of covariance was performed for the payoff situation, with category width as the independent variable and information demand as the dependent variable. The covariates were numerical ability and utility of reward.

The hypothesis would be supported if an F value significant at the .05 level were found between levels of category width on information demand in both payoff and non-payoff conditions.

Hypothesis 3

Hypothesis 3 states that subjects for whom the reward has greater utility will demand less information than subjects for whom the reward has less utility.

A one-way analysis of covariance was performed comparing levels of utility on information demand with payoff, using numerical ability as the covariate. The hypothesis would be supported if a significant difference were found between high and low utility of reward on information demand; and if an examination of the difference were to indicate that those subjects showing less utility for the reward demanded significantly more information. A difference was considered significant at the .05 level.

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[1] Janet D. Elashoff, "Analysis of Covariance: A Delicate Instrument," American Educational Research Journal, 1969, 6, 383-401.

Hypothesis 4

Hypothesis 4 states that there will be no differences in the amount of information demanded prior to making a decision between high need-achievers and low need-achievers.

To test this hypothesis the same statistical analyses were used as were used to test hypothesis 2. The hypothesis would be supported if no significant differences were found in both the payoff and non-payoff situations. A difference was considered significant at the .05 level.

Hypothesis 5

Hypothesis 5 states that there will be no difference between those who have a high fear of failure and those who have a low fear of failure in the amount of information demanded prior to making a decision.

To test this hypothesis the same statistical analyses were used as were used to test hypotheses 2 and 4. The hypothesis would be supported if no significant differences were found in both the payoff and non-payoff situations. A difference was considered significant at the .05 level.

Hypothesis 6

Hypothesis 6 states that the need to achieve and fear of failure will interact to affect information demand in both a payoff and non-payoff decision situation.

Hypothesis 6a.--This hypothesis states that when compared to the group high in fear of failure and low in need achievement, subjects identified as high in need achievement and low in fear of failure will show the smaller deviation about the mean of the total sample in the amount of information demanded prior to making a decision.

The mean and standard deviation of scores on information demand were computed for the subjects identified as high in the need to achieve and low in fear of failure. The mean and standard deviation of scores for subjects identified as low in the need to achieve and high in fear of failure were also computed. The hypothesis would be supported if the ratio of the variances of the low need to achieve-high fear of failure group to the high need to achieve-low fear of failure group yielded an F value significant at the .05 level.

Hypothesis 6b.--This hypothesis states that when compared to the group high in need achievement and low in fear of failure, subjects identified as high in fear of failure and low in need achievement will show the larger deviation about the mean of the total sample in the amount of information demanded prior to making a decision.

The data was analyzed as in hypothesis 6a. The hypothesis would be confirmed if the ratio of the variances of the low need to achieve-high fear of failure group to the high need to achieve-low fear of failure group yielded an F value significant at the .05 level.

Hypothesis 6c.--This hypothesis states that subjects who are high in need achievement and high in fear of failure will be equal in central tendency and variability to all the subjects in the total sample in the amount of information demanded prior to making a decision.

The mean and standard deviation of information demand scores were computed for subjects high in need achievement and high in fear of failure. The mean and standard deviation of scores were also computed for the remaining subjects. A t test was used to examine the difference between the selected sample and residual sample means. An F test was used to compare the variances of the selected sample and residual sample. A difference at the .05 level was considered significant. The hypothesis would be confirmed if no significant differences existed.

Hypothesis 6d.--This hypothesis states that subjects who are low in need achievement and low in fear of failure will be equal in central tendency and variability to all the subjects in the total sample in the amount of information demanded prior to making a decision.

To test this hypothesis the same statistical analyses were used as were used to test hypothesis 6c. The hypothesis would be confirmed if no significant differences existed. A difference at the .05 level was considered significant.

CHAPTER IV

RESULTS

Preliminary Analyses

Identification of Subjects as High or Low on Independent Variables

Means and standard deviations were computed on scores for all 168 subjects on the independent variables; category width, fear of failure, the need to achieve, and utility of reward. The results are shown in Table 1. The means and standard deviations for all subjects on all variables are shown in Appendix I. Subjects scoring .25 standard deviations distance or more below the mean were identified as low on that variable; subjects scoring .25 standard deviations or more above the mean were identified as high on that variable.

TABLE 1

Means and Standard Deviations for
168 Subjects on the Independent Variables

Variable	Mean	Standard Deviation
Category Width	58.05	21.60
Fear of Failure	265.12	48.15
Need to Achieve	8.58	4.09
Utility of Reward	20.20	4.19

The Relationship Between Aptitude and the Dependent Variable

Correlation coefficients were computed between numerical ability and information demand under both payoff and non-payoff conditions. The correlation coefficient between numerical ability and information demand under non-payoff was .042 ($p > .05$), whereas the correlation between numerical ability and information demand under payoff conditions was -.218 ($p < .01$).

Because of the relationships indicated by the correlations it was decided to perform the analyses under non-payoff conditions without using numerical ability as a covariate since its contribution to the variability in the dependent variable was negligible. The significant correlation found between numerical ability and information demand under payoff conditions indicated the necessity to use aptitude as a covariate for the analyses under payoff conditions.

Since a basic postulate underlying the use of the analysis of covariance is that the covariate is statistically independent of the treatment effect,[1] correlations between numerical ability and independent variables were also examined. Table 2 gives a summary of the correlations of numerical ability with both the dependent and independent variables. The correlation coefficients between numerical ability and category width were .124 ($p > .05$), -.283 ($p < .01$) with fear of failure, .138 ($p > .05$) with the need to achieve, and .172 ($p < .05$) with utility of reward.

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[1] J. D. Elashoff, "Analysis of Covariance: A Delicate Instrument," American Educational Research Journal, 1969, 6, 383-401.

TABLE 2

Correlations Between Numerical Ability and Independent and Dependent Variables[a]

		Independent Variables			Dependent Variables Information Demand	
	Category Width	Fear of Failure	Need to Achieve	Utility of Reward	Non-Payoff	Payoff
Numerical Ability	.124	-.283**	.138	.172*	.042	-.218**

[a] These correlations are based on all 168 subjects.

**$p < .01$

*$p < .05$

An additional method to determine the independence of the covariate from the treatment effects was used; t tests were performed to determine whether or not significant differences existed in the covariate means between subjects identified as high and low on fear of failure and utility of reward, as well as category width and the need to achieve. Table 3 indicates the means and standard deviations for numerical ability for each group as well as the results of the t tests.

The significant t value (-3.71, $p < .01$) for fear of failure indicated that the independent variable did affect the covariate numerical ability. It was decided to analyze information demand under payoff conditions using analysis of variance as well as analysis of covariance. Caution was used in the interpretation and generalizability of the analysis of covariance results with numerical ability as a covariate for the independent variable fear of failure.

TABLE 3

Means, Standard Deviations and t Values Indicating Significance of Differences in Numerical Ability for Subjects Identified as High and Low on Independent Variables

Variable	Level	N	Mean	S.D.	t
Category Width	High	67	23.34	8.92	1.94
	Low	58	20.55	7.26	
Fear of Failure	High	65	19.43	6.87	-3.71**
	Low	62	24.66	8.92	
Need to Achieve	High	73	22.22	7.06	1.54
	Low	68	20.16	8.68	
Utility of Reward	High	74	23.43	8.34	1.78
	Low	84	20.50	7.69	

$^{**}p < .01$

Differences in Size of Groups Identified as High and Low on the Independent Variables

Table 4 shows the chi square values testing whether or not the distribution of subjects over the two levels of the independent variables departed significantly from chance. As shown, all the chi squares were non-significant indicating that the differences in the number of subjects at each level for each independent variable were not enough to directly limit the generalizations made based on any differences found in the high and low groups on the dependent variable, information demand.

Tests of the Hypotheses

Hypothesis 1

Hypothesis 1 states that subjects will demand more information in a non-payoff situation than in a payoff situation prior to making a decision.

As previously shown in Table 2, numerical ability was significantly correlated with information demand in a payoff situation and non-significantly in a non-payoff situation. This precluded the use of numerical ability as a covariate since the regression adjustment might have removed part of the treatment effect.

The results of the analysis of variance of a 2 x 2 Latin-square design, testing the significance of difference between information demand in a payoff and non-payoff situation are given in Table 5.[1]

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[1] A. L. Edwards, Experimental Design in Psychological Research, New York: Holt, Rinehart & Winston, 1960, 271-274.

TABLE 4

Size of Groups Identified as High and Low on the Independent Variables with Chi Square Values Testing Differences

Variable	Level	N	Chi Square[a]
Category Width	High	67	.65
	Low	58	
Fear of Failure	High	65	
	Low	62	.04
Need to Achieve	High	73	
	Low	68	.18
Utility of Reward	High	74	
	Low	84	.63
Fear of Failure and Need to Achieve	High F-F High n-Achieve	31	
	High F-F Low n-Achieve	31	2.96
	Low-F-F High n-Achieve	27	
	Low F-F Low n-Achieve	20	

[a] None of these chi square values is significant ($p > .05$).

TABLE 5

Analysis of Variance of a 2 x 2 Latin-Square Design (84 Replications) with Payoff and Non-Payoff Conditions as the Independent Variables and Information Demand as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	*F*
Treatments (Payoff-Non-Payoff)	10618.88	1	10618.88	168.85***
Subjects	45623.28	167	273.19	
Periods	3943.55	1	3943.55	
Error	10440.07	166	62.89	
Total	70625.78	335		

***$p < .001$

The F value obtained, 168.85, was significant at the .001 level. Significantly more information was demanded prior to making a decision in the non-payoff situation than in the payoff situation. As a result, hypothesis 1 was supported.

Hypothesis 2

Hypothesis 2 states that broad categorizers will demand more information before making a payoff or non-payoff decision than narrow categorizers.

The means and standard deviations of information demand for each level of category width are found in Appendix I.

The correlation between category width and information demand under non-payoff conditions was non-significant (r = .097) as well as the correlation between category width and information demand under payoff conditions (r = -.055). This was followed by the computation of the correlation ratio for each experimental condition. Table 6 gives the Pearson correlations, the correlation ratios, the tests of their significant difference from zero, and the measure of nonlinearity of regression. The non-significant F values indicated that the relationship between category width and information demand was not curvilinear.

The results of the analysis of variance for the non-payoff situation are presented in Table 7. The F value obtained was significant (F = 5.72, $p < .05$). Table 8 gives the results of the analyses of variance and covariance under payoff conditions. Differences between broad and narrow categorizers in the amount of information demanded were non-significant in the analysis of variance (F = .08) and covariance (F = .09). Hypothesis 2 was supported in the non-payoff situation but

TABLE 6

The Relation Between Category Width and Information Demand under Payoff and Non-Payoff Conditions

Experimental Condition	Pearson Correlation r	Correlation Ratio[a] η	Significance of Correlation Ratio F	Significance of Departure From Linearity F
Payoff	-.055	.311	1.54	1.65
Non-Payoff	.097	.252	.97	.92

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[a] This was computed using the method described by Q. McNemar, Psychological Statistics (3rd Edition), New York: John Wiley & Sons, Inc., 1962, 270-281.

TABLE 7

Analysis of Variance with Category Width as the Independent Variable and Information Demand under Non-Payoff Conditions as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Broad and Narrow Categorizers	1341.79	1	1341.79	5.72*
Error	28873.68	123	234.75	
Total	30215.47	124		

$*p < .05$

TABLE 8

Analyses of Variance and Covariance with Category Width as the Independent Variable and Information Demand under Payoff Conditions as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	*F*
	Analysis of Variance			
Broad and Narrow Categorizers	8.49	1	8.49	.08
Error	13063.14	123	106.20	
Total	13071.63	124		
	Analysis of Covariance with One Covariate: Utility of Reward			
Broad and Narrow Categorizers	8.29	1	8.29	.09
Error	11053.83	122	90.61	
Total	11062.12	123		
	Analysis of Covariance with Two Covariates: Utility of Reward and Numerical Ability			
Broad and Narrow Categorizers	.81	1	.81	.01
Error	10524.54	121	86.98	
Total	10525.35	122		

was not supported under payoff conditions.

Hypothesis 3

Hypothesis 3 states that subjects for whom the reward has greater utility will demand less information than subjects for whom the reward has less utility.

The means and standard deviations of information demand for each level of utility of reward are found in Appendix I.

The results of the analyses are listed in Table 9. Whether or not numerical ability was controlled for, subjects for whom the reward has greater utility demanded significantly less information than subjects for whom the reward has less utility. Therefore, hypothesis 3 was supported.

Hypothesis 4

Hypothesis 4 states that there will be no differences in the amount of information demanded prior to making a decision between high need-achievers and low need-achievers.

The means and standard deviations of information demand scores for each level of the need to achieve are found in Appendix I.

The results of the analysis of variance for non-payoff conditions, and analyses of variance and covariance for payoff conditions are given in Tables 10 and 11. All differences between high need-achievers and low need-achievers in the amount of information they demanded prior to making a decision were non-significant. Controlling for the value of the reward and numerical ability in the payoff situation did not make a difference. Hypothesis 4 was supported.

TABLE 9

Analyses of Variance and Covariance with Utility of Reward as the Independent Variable and Information Demand under Payoff Conditions as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Analysis of Variance				
High-Low Utility of Reward	1832.94	1	1832.94	16.85**
Error	16965.18	156	108.75	
Total	18798.12	157		
Analysis of Covariance with Numerical Ability as Covariate				
High-Low Utility of Reward	1384.76	1	1384.76	13.20**
Error	16261.39	155	104.91	
Total	17646.15	156		

**$p < .01$

TABLE 10

Analysis of Variance with Need to Achieve as the Independent Variable and Information Demand under Non-payoff Conditions as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
High-Low Need to Achieve	293.45	1	293.45	1.33
Error	30720.99	139	221.01	
Total	31014.44	140		

TABLE 11

Analyses of Variance and Covariance with Need to Achieve as the Independent Variable and Information Demand under Payoff Conditions as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Analysis of Variance				
High-Low Need to Achieve	8.82	1	8.82	.08
Error	15256.28	139	109.76	
Total	15265.10	140		
Analysis of Covariance with one Covariate: Utility of Reward				
High-Low Need to Achieve	25.96	1	25.96	.25
Error	13850.42	138	100.37	
Total	13876.38	139		
Analysis of Covariance with two Covariates: Utility of Reward and Numerical Ability				
High-Low Need to Achieve	59.69	1	59.69	.63
Error	13094.98	137	95.58	
Total	13154.67	138		

Hypothesis 5

Hypothesis 5 states that there will be no difference between those who have a high fear of failure and those who have a low fear of failure in the amount of information demanded prior to making a decision.

The means and standard deviations of information demand scores for each level of fear of failure are found in Appendix I.

The results of the analysis of variance under non-payoff conditions are found in Table 12; the results of the analyses of variance and covariance under payoff conditions are found in Table 13. All differences between subjects identified as high and low in fear of failure in the amount of information demanded prior to making a decision were non-significant. Controlling for the value of the reward and numerical ability in the payoff situation did not make a difference. Hypothesis 5 was supported.

Hypothesis 6

Hypothesis 6 states that the need to achieve and fear of failure will interact to affect information demand in both a payoff and non-payoff decision situation.

Hypothesis 6a

This hypothesis states that when compared to the group high in fear of failure and low in need achievement, subjects identified as high in need achievement and low in fear of failure will show the smaller deviation about the mean of the total sample in the amount of information demanded prior to making a decision.

TABLE 12

Analysis of Variance with Fear of Failure as the Independent Variable and Information Demand under Non-Payoff Conditions as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	*F*
High-Low Fear of Failure	67.42	1	67.42	.28
Error	29975.92	125	239.81	
Total	30043.34	126		

TABLE 13

Analyses of Variance and Covariance with Fear of Failure as the Independent Variable and Information Demand under Payoff Conditions as the Dependent Variable

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Sqaure	*F*
Analysis of Variance				
High-Low Fear of Failure	2.73	1	2.73	.025
Error	13202.58	125	105.62	
Total	13205.31	126		
Analysis of Covariance with One Covariate: Utility of Reward				
High-Low Fear of Failure	14.02	1	14.02	.14
Error	12220.99	124	98.56	
Total	12235.01	125		
Analysis of Covariance with two Covariates: Utility of Reward and Numerical Ability				
High-Low Fear of Failure	189.91	1	189.91	2.12
Error	10996.37	123	89.40	
Total	11186.28	124		

The F values obtained by comparing the variances of information demand scores of the high fear of failure - low need to achieve group with that of the low fear of failure - high need to achieve group were non-significant (Table 14). Hypothesis 6a was not supported.

TABLE 14

Means, Standard Deviations, Variances and F Values Comparing Low Need to Achieve-High Fear of Failure Group with High Need to Achieve - Low Fear of Failure Group on Information Demand

Experimental Condition	Group	N	Mean	Standard Deviation S	Variance S^2	F
Payoff	High F-F Low n-Achieve	31	12.14	8.87	78.68	1.12
	Low F-F High n-Achieve	27	12.14	9.45	89.30	
Non-Payoff	High F-F Low n-Achieve	31	22.48	13.73	188.51	1.62
	Low F-F High n-Achieve	27	26.31	17.50	306.25	

Hypothesis 6b

This hypothesis states that when compared to the group high in need achievement and low in fear of failure, subjects identified as high in fear of failure and low in need achievement will show the larger deviation about the mean of the total sample in the amount of information demanded prior to making a decision.

The results for the analysis for hypothesis 6a were also used for hypothesis 6b. Since, as stated previously, the F values were non-significant in both the payoff and non-payoff situations, hypothesis 6b was not supported.

Hypothesis 6c

This hypothesis states that subjects who are high in need achievement and high in fear of failure will be equal in central tendency and variability to all the subjects in the total sample in the amount of information demanded prior to making a decision.

Table 15 presents the results of the analyses examining the differences between the selected sample and residual sample means and variances. Both the t values and F values obtained in the analyses were non-significant. Hypothesis 6c was supported.

Hypothesis 6d

This hypothesis states that subjects who are low in need achievement and low in fear of failure will be equal in central tendency and variability to all the subjects in the total sample in the amount of information demanded prior to making a decision.

The results of the analyses examining the differences between the selected sample and residual sample means and variances are presented in Table 16. The t values for both payoff and non-payoff conditions testing the differences between the means of the two groups were non-significant. The F value comparing the variability of the two groups in information demand under non-payoff conditions was non-significant whereas it indicated significant differences under payoff conditions (F = 1.93, $p < .05$). As a result, hypothesis 6d was supported under non-payoff conditions, and was not supported under payoff conditions.

TABLE 15

Comparison of High Need to Achieve - High Fear of Failure Group with Residual Sample on Information Demand

Experimental Condition	Group	N	Mean	Standard Deviation S	Variance S^2	t	F
Payoff	High n-Achieve High F-F	31	13.91	8.99	79.03	.72	1.26
	Residual Sample	78	12.50	9.99	99.80		
Non-Payoff	High n-Achieve High F-F	31	23.94	14.50	210.25	.21	1.13
	Residual Sample	78	23.28	15.47	239.32		

TABLE 16

Comparison of Low Need to Achieve - Low Fear of Failure Group with Residual Sample on Information Demand

Experimental Condition	Group	N	Mean	Standard Deviation _S_	Variance $\underline{S}^2$	_t_	_F_
Payoff	Low n-Achieve Low F-F	20	13.55	12.50	156.25	.27	1.93*
	Residual Sample	89	12.76	9.00	81.00		
Non-Payoff	Low n-Achieve Low F-F	20	20.43	14.68	215.50	1.02	1.07
	Residual Sample	89	24.15	15.23	231.95		

*p .05

CHAPTER V

INTERPRETATION AND DISCUSSION OF THE DATA

The purpose of this investigation was to examine the effect of personality and situational variables on the amount of information demanded prior to making a decision under conditions of uncertainty. The problems explored and the hypotheses tested were designed to test specific theories which have contributed to the expanding amount of research in the area of decision making. The results of the hypotheses will be discussed in the context of their particular theories. Some preliminary statistical analyses, which determined the nature of some of the analyses which followed in the testing of the hypotheses, were performed and related to the interpretation of the results. A discussion of these findings will be presented first.

Preliminary Findings

The Relationship Between Aptitude and the Dependent Variable

The finding that numerical ability was related to information demand in a payoff situation and not related in a non-payoff situation determined its use as a covariate. Since numerical ability did not contribute to the variability in the amount of information demanded prior to making a decision in a non-payoff situation, it was not used as a covariate under those conditions. The effect of numerical ability on information requested was removed under payoff conditions.

The moderate negative correlation between numerical ability and information demand under payoff conditions suggests that more intelligent subjects acted in such a way as to maximize earnings. Since each additional piece of information decreased the amount of the reward or possible earnings for a correct solution, the subjects higher in numerical ability had developed a better strategy. If one could view that a person high in numerical ability would be more confident in a situation that required the averaging of numbers, this finding was in agreement with those of Westcott,[1] who found that more confident individuals tended to rely on less information.

The indication of an almost random relation between numerical ability and information demand in a non-payoff situation brings an interesting interpretation. The subjects were displaying the use of "conservation of energy". Subjects who were bright were not using their intelligence to develop a strategy in a situation in which it did not matter. Variables other than intelligence determined their variability in behavior.

In order to assure statistical independence from the treatments, numerical ability was correlated with each of the independent variables. Numerical ability was not found to correlate significantly with category width. This seems to disagree with the findings of Pettigrew[2] whose study of the instrument indicated that category width scores correlated significantly with the quantitative portion of the ACE. The difference could be explained in that the Numerical Ability subtest of the Differential Aptitude Tests contains only direct numerical computation without any reading; the test could be measuring a different kind of quantitative ability than that measured by the ACE. In addition, the populations for whom the correlations were computed were different. Pettigrew based his correlations on a sample of 200 college undergraduates, including both males and females, whereas this study used a sample of 168 high school males.

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[1] Westcott, op. cit., Psychological Reports

[2] Pettigrew, op. cit.

Numerical ability was not found to be related to the need to achieve but was found to be inversely related to fear of failure. This indicated that people who were high in measured fear of failure obtained low numerical ability scores. Since fear of failure is a measure of test anxiety, and correlation does not allow any possible cause-and-effect interpretations, there are two possible inferences that can be made: 1) that subjects who are high in fear of failure have learned by past failure experience justification for their anxiety; these are the subjects who do not perform successfully on examinations or 2) that high test anxiety on a numerical ability test will act to depress performance. The division of the subjects into levels of fear of failure and resulting examination of mean performance on numerical ability indicated that a high degree of test anxiety did indeed negatively affect performance in numerical computation.

The value of the reward or utility of money was directly and significantly related to numerical ability. Yet numerical ability could only account for three percent of the variability in the subjective value of the reward. The measurement of the value of the reward was indirect in that it was inferred from subjects' responses to a paper-and-pencil risk situation. It required no mathematical ability.

Differences in Size of Groups Identified as High and Low on the Independent Variables

Other research studies which have examined the effects of category width, fear of failure and the need to achieve on risk-taking behavior have used the median to divide subjects into groups identified as high and low on each variable. The exception has been the variable, utility of money, on which no research has been done. In this study subjects were assigned to the category, high or low, on the basis of .25 standard deviation score distance from the mean. The unequal number of subjects appearing at each level indicated that the distribution of scores for each variable was slightly skewed. Even though the groups contained an unequal number of subjects the differences were not enough to limit comparisons. The point being made is the note of caution in the comparison of results. No definite or absolute score limits have been set up to define high and low scores on a single variable. High and low have always been defined within the context of a particular sample. Especially when subjects are divided at the median, it may well be that scores within one sample defined as high may belong to the group identified as low in another sample. This possibility limits comparisons from study to study.

One could readily respond to this possible confusion by noting the means and standard deviations reported by the various researchers for the different levels on each variable. Then another problem is brought to light, differences in scoring and testing stimuli. For example, Kogan and Wallach[1] used only one of the two factors identified in the Category Width scale and did not indicate which items they accepted as loading high on that factor. In addition, by eliminating items from the 20-item questionnaire, they may well have deleted those that discriminated best between the broad and narrow categorizers.

For measuring fear of failure, Mandler and Sarason[2] devised a scale 15 centimeters long, representing a continuum of feeling in response to statements for each item. But studies have used various procedures in scoring. Studies have divided the line into nine equal parts giving scores from one to nine for each item, or eleven equal parts giving zero to ten for each item. Some have divided the line into 15 equal centimeter intervals giving scores from 1 to 15 for each item. A scoring system dividing the line into five equal intervals has also been devised. Unless writers are clear on the scoring system they employed, difficulties still arise on the comparability of groups even though means are reported.

In studies measuring the need to achieve, the pictures used as stimuli were named as they were identified here. But all studies have not used the same pictures and they vary in their ability to elicit achievement imagery. All this serves to qualify the comparisons made between the behavior of the subjects identified in this study as high and low on each independent variable and those in other studies cited.

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[1] Kogan and Wallach, op. cit., Risk Taking: A Study in Cognition and Personality, p. 146.

[2] Mandler and Sarason, op. cit.

The Hypotheses

Hypothesis 1

Hypothesis 1 was proposed to determine the effect of monetary payoff on the amount of information subjects will demand prior to making a decision under conditions of uncertainty. If subjects were to have nothing at stake, nothing to gain or lose by being right or wrong, the study would not have provided any useful addition to the theory of decision making. The situation in which the variables were measured had to be meaningful. In order to determine the effect of payoff, information demand was measured for an expanded judgment task under both payoff and non-payoff conditions. The hypothesis was supported in that subjects requested significantly less information under payoff conditions. The order of presentation of the decision task under non-payoff or payoff conditions did not make a difference. What made the difference was the reward.

This agrees with the study of Lanzetta and Kanareff[1] who found that subjects were less likely to ask for additional information when a cost was attached to information. Subjects in the present study were exhibiting a less conservative strategy with payoff. It may have been that if no cost had been attached to information seeking, subjects would have exhibited a more conservative strategy.

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[1] J. T. Lanzetta and V. T. Kanareff, "Information Cost, Amount of Payoff, and Level of Aspiration as Determinants of Information Seeking in Decision Making," Behavioral Science, 1962, 7, 459-473.

These results reaffirm in part the work of Irwin and Smith[1] who found through experimental situations that the amount of information was directly related to the value of the prize and inversely related to the monetary cost per clue. The results of this study did not indicate which was the greater determiner of the subject's behavior, the goal, or the cost of obtaining the goal. They have only shown that having a monetary prize did make a difference in the subject's information seeking behavior. He took greater risks.

The test of this hypothesis also responds to a question raised by Kogan and Wallach[2] on the outcome of Edwards' experiment summarized by them.[3] Edwards found that as subjects proceeded from imaginary gambling sessions to real gambling sessions there was a marked increase in risk taking, a preference for bets with low probabilities of winning and large monetary payoffs as opposed to bets with a high probability of winning and low monetary payoffs. Kogan and Wallach raised the possibilities of order effect. Analysis of hypothesis 1 took this into account, showing that order did not make the difference. The results are in agreement with Edwards.

Hypothesis 2

Hypothesis 2 was proposed to determine the validity of the conceptual view of category width as a risk-taking construct, specifically as it related to decision making. Pettigrew[1] suggested in his study of the properties of the Category Width scale that the broad and narrow categorizers represented different kinds of risk takers. The broad categorizer was willing to take the risk of inclusion whereas the narrow categorizer was willing to take the risk of exclusion. The broad categorizer would wish to reduce uncertainty by including all the deviant cases. The narrow categorizer was assumed to act as though the environment were free of extremes.

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[1] Irwin and Smith, op. cit., Journal of Experimental Psychology, 1957.

[2] Kogan and Wallach, op. cit., New Directions in Psychology III, pp. 139-140.

[3] Ibid.

Pettigrew's view was directly related to the consistent differences Bruner found in individuals in concept attainment.[2] For example, on learning the concept of a "trustworthy person", an individual encounters many attributes. He has to determine whether or not they are exemplars of the category "trustworthy person". Some individuals will repeatedly test new instances just to be sure; some will decide much sooner that they know what or who a "trustworthy person" is. Trusting too soon has its penalties; not trusting soon enough has its own consequences. Developing this concept required information seeking. Hypothesis 2 is a test of the extension of this behavior to information gathering when making decisions under conditions of uncertainty.

The differences between broad and narrow categorizers on information demand were analyzed for both payoff and non-payoff conditions. Broad categorizers demanded significantly more information than narrow categorizers under non-payoff conditions. There were no differences between the two groups in information demanded under payoff conditions even though value of the reward and numerical ability were controlled for.

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[1] Pettigrew, op. cit.

[2] Bruner, et al., op. cit.

Interestingly enough, the correlations between category width and information demand under payoff and non-payoff conditions were found to be non-significant. This was in agreement with the results of Kogan and Wallach,[1] for payoff conditions. Yet an analysis of the data revealed that there was no significant departure from linearity for the relation between category width and information demand in either the payoff or non-payoff experimental situations. An examination of the scattergrams relating category width to information demand under both experimental conditions explained the seemingly contradictory low correlation under non-payoff conditions and significant difference between the two levels on information demand. Under non-payoff conditions the middle group, which had been discarded from the analysis, showed the greatest variability.

It appeared that under non-payoff conditions, differences did exist between the two levels in the amount of information requested prior to making a decision. The broad categorizer exhibited a more conservative strategy than the narrow categorizer. He collected more information.

Under payoff conditions, any differences were wiped out. Other variables were elicited by the possibilities of earning money that determined behavior. Category width no longer made a difference.

This in fact agrees with Pettigrew's validation of the Category Width scale. The experimental situation involved no monetary reward.

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[1] Kogan and Wallach, op. cit. Risk Taking: A Study in Cognition and Personality, p. 146.

The situation was an experimental analog to the paper-and-pencil test.

It may well be that the cognitive strategies that distinguish the broad categorizer from the narrow categorizer do not operate under conditions of heightened risk. Other variables take over.

Hypothesis 3

Hypothesis 3 was proposed in order to clarify the theoretical implications of the decision theory model formulated by Edwards. This updated mathematical view of choice is based on the concept of subjective expected utility (SEU).[1] Individuals are seen to make their decisions under conditions of uncertainty on the basis of two variables: 1) the subjective value (utility) of the objects or outcomes and 2) the subjective probability of obtaining them. The possibilities are weighed in terms of the probability-utility products. The choice bringing the highest subjective expected utility is the one made.

This approach could be applied to the decision task used as the dependent variable. With each piece of information demanded, subjects had to make a choice whether or not to make a decision. Each individual took into account; 1) the value or utility of the reward, 2) the fact that each additional clue reduced the amount of that reward and, 3) the probability of his success or failure.

The tested hypothesis evaluated the effect of the utility of the reward on the amount of information individuals demanded prior to making a decision. The evaluation only could be meaningfully evaluated under payoff conditions. Since the information demanded was averaged over five trials, the utility of the possible total earnings, five dollars, was computed for each individual.

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[1] Edwards, op. cit., Annual Review of Psychology.

Since there were only two possible answers to each item, above or below zero, the objective probability of success or failure by guessing was .50 and was, therefore, constant. And if it could be assumed that the subject's subjective view of the probability of success or failure was consonant with the objective reality, then the positive utility of the reward would affect his behavior. What has been stated is that subjects will not give money the same degree of value. The differences in utility of five dollars were measured and the effect was determined.

Subjects in this study who were high in the utility of the reward demanded significantly less information than those who were low in the utility of the reward. Since increased information decreased the size of the reward, subjects who placed the greater value on that amount of money would be expected to act in such a way as to obtain it. This statement assumes knowledge of equal likelihood of success or failure with each clue.

Yet another view could be taken. The subjective view of the probability of success or failure could have been related to the subject's numerical ability for at least two reasons: 1) the individual's ability to translate two choices into .50 probability terms would be dependent upon mathematical knowledge and 2) past success with numbers could have biased an individual's view of his probability of success upward therefore affecting the amount of information demanded. In order to eliminate the possible effect of numerical ability, an additional analysis was performed using numerical ability as a covariate. The difference between the two groups in the amount of information required to make a decision was still significant. Subjects who put greater value on the goal were displaying a more risky strategy.

Even though Irwin did not evaluate the different utility values of money for individuals, he arrived at an interesting speculation which might be applicable here.[1] He suggested that subjects who valued money more may have altered their view so as to increase their perceived probability of success. This view of Irwin's could be another possible explanation for the behavioral differences. But the speculation that value of the goal and the subjective probability of obtaining it are interactive challenges the SEU model of decision as it now stands. This is no disclaimer of the value of Irwin's point of view, since mathematical decision theory models have certainly left unanswered many questions as to the nature of the decision-making process. This particular hypothesis tested indicated the worth of utility as a concept and that in fact people do not view money the same way. It further indicated that the assumption of monetary rewards in laboratory experiments as a way to get people ego involved in a meaningful situation needs to be rethought. The monetary reward itself cannot be considered a constant; it is also having differential effects on subjects' behavior.

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[1] F. Irwin, "Stated Expectations as Functions of Probability and Desirability of Outcomes," Journal of Personality, 1953, 21, 329-335.

Hypotheses 4, 5, and 6

Hypotheses 4, 5 and 6 (a,b,c,d) were designed to explore the applicability of the theory of achievement motivation to decision making under uncertainty conditions. Since all three hypotheses were closely related in theory, they will be discussed together.

The theory of achievement motivation, given birth to by McClelland[1] and as developed and elaborated by Atkinson,[2] relates to the area of achievement oriented activities. When some performance or activity is viewed to be instrumental to achievement, motives which are latent within the individual are elicited. The two motives dealt with in the theory are the motive to achieve success and the motive to avoid failure. Whenever performance is evaluated against some standard of excellence both motives are aroused, the strength of each varying from individual to individual and from situation to situation.

The resulting motivation for each person is viewed as the summation of the approach and avoidance tendencies for each situation. The tendency to achieve success is defined as the product of the particular motive to succeed, the value of the outcome (incentive), and the probability of achieving success (expectancy). The tendency to avoid failure is defined as the product of the particular motive to avoid failure, the negative incentive of the task, and probability of failure. The relationship is.

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[1] McClelland et al., op. cit., The Achievement Motive.

[2] Atkinson and Feather, op. cit.

defined in symbolic terms below:

$$\text{Resultant Motivation} = \text{Tendency to achieve success} + \text{Tendency to avoid failure}$$
$$= (M_S \times P_S \times I_S) + (M_{AF} \times P_F \times I_F)$$

Two other relationships need clarification: 1) the probability of failure (P_F) is one minus the expectancy of success ($1-P_S$), and 2) the incentive value of success increases proportionately with the task difficulty; people value what is more difficult to attain.

Given these relationships and substitutions of arbitrary numbers in the Atkinson formula, it has been shown that the motive to achieve success and the motive to avoid failure are at their strongest when the probability of success or failure is .50.[1] This means that when uncertainty is greatest (success and failure are equiprobable) approach and avoidance conflict would be greatest for those in whom the motives are of equal strength. But motives to achieve success and avoid failure are rarely equal. As a result, the theory states that individuals for whom the motive to achieve success is greater, prefer situations having .50 probability of success or failure. In individuals for whom the motive to avoid failure is greater, situations of .50 probability of success or failure create tremendous anxiety and are avoided. They have no tolerance for uncertainty and deal with the situation by one of two strategies 1) either certain success by a very conservative strategy or 2) almost certain failure by a very risky strategy.

The decision task used as the dependent variable represented a situation of uncertainty in which the amount of information demanded prior to making the decision could be a measure of the degree of risk taken by subjects measured on the need to achieve and fear of failure. The two conditions, payoff and non-payoff provided the opportunity to test the Atkinson model for achievement-related decision situations to a particular decision context, one in which information seeking was required.

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[1] Atkinson and Feather, op. cit.

Since the theory predicts behavior on the basis of the relative strengths of the two motives, the need to achieve and fear of failure, the results of the tests of hypotheses 4 and 5 were expected. To elaborate, hypothesis 4 was proposed to determine whether differences in the strength of the motive, the need to achieve, would affect subjects' information seeking behavior. This was examined under both payoff and non-payoff conditions. Non-payoff conditions provided no stimuli to elicit the achievement motive. It was actually a neutral situation. Therefore the fact that subjects high in the need to achieve and subjects low in the need to achieve exhibited no difference in the amount of information demanded prior to making a decision was expected.

Under payoff conditions other variables were considered. The theory points out the interactive effect of incentive and probability of success. Yet, even though the value of the reward and numerical ability were controlled for, there was still no signficant difference between high and low need-achievers in information demand.

Fear of failure scores and need to achieve scores were found to be independent of each other ($\underline{r} = -.089$, $p > .05$). This agreed with correlations reported by Brody,[1] and Atkinson and Litwin.[2] This random relation just adds weight to the point of view that a subject's being high in the need to achieve does not necessarily imply that he is low in fear of failure.

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[1] Brody, op. cit.

[2] Atkinson and Litwin, op. cit.

Hypothesis 5 provided an examination of the influence of fear of failure on information demand under both payoff and non-payoff conditions. The results were the same as that found for the need to achieve.

Each variable considered alone could not explain behavioral differences in the amount of information subjects demanded prior to making a decision, even though the incentive value of the reward and probability of success were controlled for.

Hypothesis 6 (a,b,c,d) provided the test of Atkinson's model as formulated. Subjects who were high in the need to achieve and low in fear of failure were hypothesized to prefer a strategy of intermediate risk, whereas subjects identified as high in fear of failure and low in the need to achieve were hypothesized to prefer extreme strategies. Subjects who were equal in the strengths of the need to achieve and fear of failure (low-low and high-high) were considered to display intermediate strategies. It was hypothesized that those subjects who exhibited equal motive strengths would be representative of the total sample of which they were a part in terms of the risks they would take.

Hypotheses 6a and 6b were restatements of each other, predicting the behavior of different groups. The variability on information demanded of the group identified as high fear of failure - low need to achieve was compared to that of the group identified as high need to achieve - low fear of failure. It was expected that since the group high in fear of failure would pick extreme strategies to deal with their anxiety that the ratio of variances of the two groups would be significant. The hypothesis was not supported.

The non-significant difference in variability was expected for non-payoff conditions since neither motive was expected to have been elicited under neutral conditions. The non-significant difference in variability under payoff conditions brings some possible interpretations.

Rather than to deny the worth of the results, their acceptance would indicate that Atkinson's prediction of the groups' risk-taking preferences does not apply to a decision situation in which information seeking is required. The results did not agree with the classic experiments in ring toss or shuffleboard,[1] but the conditions of the experiments were notably different. Subjects in the ring toss experiments were involved in a competitive situation in which their behavior was visible to other members of the group. In a group atmosphere other variables as affiliative needs may have moderated the effect of the need to achieve and fear of failure. Also the ring toss experiment allowed instant feedback of success or failure. Subjects in this study had to adopt a strategy ignorant of its successfulness. This study provided a more isolated experience for each subject where any risks taken no longer served any "face-saving" characteristics. The isolated conditions could have decreased the extreme variability in risk-taking shown in competitive situations by subjects high in fear of failure.

Another possible explanation could be the presence of monetary incentives and pay for time taking tests. Litwin[2] indicated in his study that subjects high in the motive to achieve success were not oblivious of monetary incentives. It could have been that other motives were aroused with monetary incentives that negated or suppressed the effect of the need to achieve and fear of failure in that situation. It could also have been that anxiety or fear of failure was never aroused because the subjects really had nothing to lose that was theirs. They were being paid for their time and there was always the possibility of "picking up" extra money in the experimental situation. They really had no reason that was rational to fear failure. No one was watching or making judgments as in the ring toss experiments. Their egos did not even have to deal with any threat of immediate failure through feedback. Hypotheses 6c and 6d were designed to examine the risk-taking behavior of the groups ignored in research, those subjects who were equal in the strengths of the need to achieve and fear of failure. These groups of subjects were hypothesized to act with the same overall degree of risk exhibited by the sample of which they were a part. They would represent the average member of the sample of subjects measured on the need to achieve and fear of failure.

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[1] Atkinson and Litwin, op. cit.

[2] Litwin, op. cit.

Hypothesis 6c compared the information-seeking behavior of the subjects identified as high in the need to achieve and high in fear of failure with everyone else's behavior. The results were as expected for both non-payoff and payoff conditions. Since under non-payoff conditions neither motive would be elicited, comparison on those motives would bring no differences. Payoff conditions did show the subgroup to be essentially the same in the mean amount of information demanded and variability in information demanded prior to making a decision.

Hypothesis 6d compared the information-seeking behavior of the subjects identified as low in the need to achieve and low in fear of failure with the rest of the sample. The results for non-payoff conditions were as expected. The group did not differ significantly from the rest of the sample in central tendency or variability in information demanded prior to making a decision. The results under payoff conditions were the surprise. The subjects exhibited significantly greater variability in the amount of information demanded when compared to the residual sample. There were only five chances out of one hundred that this could have occurred by chance (Type I error). This result offers another possible explanation for the behavior exhibited in the test of hypothesis 6.

It could be hypothesized that under conditions of extrinsic motivation as monetary payoff, many competing motives were elicited, and were not measured in this experiment nor taken into account. It could also be hypothesized that fear of failure may in fact have been elicited and acted as an inhibiting tendency. In addition, this other motive, which may have been competing with the need to achieve success may have set up a conflict situation. Therefore, in the subgroup low in the need to achieve and low in fear of failure, the unidentified motive might be free to operate and differentiate behavior. As a result, that group now shows a greater spread in scores than the residual sample.

And of course one cannot ignore another explanation for all the results testing Atkinson's theory. Weinstein[1] has pointed out the low correlations between all the instruments used to measure the need to achieve and the low correlation between all the measures of fear of failure. Yet researchers continue to discuss their results as though they were dealing with the same constructs. The final blow to the relevance of Atkinson's theory is Weinstein's finding that subjects who were higher in the need to achieve as compared to fear of failure (as they have been discussed here) chose a higher proportion of moderate risk on only two out of nine tasks. None of the tasks involved a group situation.

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[1] M. S. Weinstein, "Achievement Motivation and Risk Preference," Journal of Personality and Social Psychology, 1969, 13, 153-172.

This again may only serve to lend support to these results and may reinforce the contention that Atkinson's theory may only apply to group competitive situations and not to risky decisions made under isolated conditions.

CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

Summary

The problem was to determine the influence of category width, the need to achieve, fear of failure, utility of reward and payoff on the amount of information demanded prior to making a decision on an expanded judgment task.

The following measures were used: (1) The Category-Width scale was used as the measure of category width. (2) The Mandler-Sarason Test Anxiety Questionnaire was used to measure fear of failure. (3) A group form of the TAT, administered under neutral conditions using four pictures, was used to measure the strength of the need to achieve. (4) The subjective value of the reward was inferred from the subject's performance on a Preference for Risks test using the method of analysis suggested by Coombs and Komorita.[1] (5) Information demand was measured by subject's performance on a punchboard device which was designed by the writer as a group adaptation of the expanded judgment task designed by Irwin and Smith.[2] Two forms of the task were administered, one under non-payoff conditions, the other under payoff conditions. (6) Scores on the

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[1] Coombs and Komorita, _op_. _cit_.

[2] Irwin and Smith, _op_. _cit_.

Numerical Ability subtest of the Differential Aptitude Tests were used as a measure to control for numerical ability.

One hundred and sixty-eight male students in their junior year of the New York City public high schools served as subjects for this study. Students were informed that they would receive $1.50 per hour for taking part in a study and that they could possibly earn additional money in the experiment. All subjects who volunteered _and_ who met the criteria for the study became participants in the experiment.

The testing was conducted in the spring and summer of 1969, either after school hours or on the weekends, off the school premises. Subjects were assigned at random to performing the information demand task with no reward either before or after the information demand task with a reward. The order of the tests administered was as follows: a) Test Anxiety Questionnaire b) Numerical Ability c) Category-Width scale d) Thematic Apperception Test e) Information Demand-A with no reward or Information Demand-B with a reward f) Utility of Reward g) Information Demand-B with a reward or Information Demand-A with no reward. Data were obtained for all subjects.

Hypothesis 1, which predicted that subjects will demand more information in a non-payoff situation than in a payoff situation prior to making a decision, was supported.

Hypothesis 2, which predicted that broad categorizers will demand more information before making a payoff or non-payoff decision than narrow categorizers, was only partially supported. Broad categorizers did demand significantly more information than narrow categorizers under non-payoff conditions. Under payoff conditions, there was no significant difference between broad and narrow categorizers in the amount of information demanded even though the value of the reward and numerical ability were controlled.

Hypothesis 3, which predicted that subjects for whom the reward has greater utility will demand less information than subjects for whom the reward has less utility, was supported. It was also supported when numerical ability was controlled for.

Hypothesis 4, which predicted that there will be no difference in the amount of information demanded prior to making a decision between high need-achievers and low need-achievers, was supported for both payoff and non-payoff conditions. Controlling for the value of the reward and numerical ability in the payoff situation did not make a difference.

Hypothesis 5, which predicted that there will be no difference between those who have a high fear of failure and those who have a low fear of failure in the amount of information demanded prior to making a decision, was supported for both payoff and non-payoff conditions. Controlling for the value of the reward and numerical ability in the payoff situation did not make a difference.

Hypothesis 6, which predicted that the need to achieve and fear of failure will interact to affect information demand in both a payoff and non-payoff decision situation, was only partially supported. It was found that subjects high in fear of failure and low in the need to achieve did not show greater variability in the amount of information demanded than subjects identified as high in the need to achieve and low in fear of failure. This was found for both payoff and non-payoff conditions. It was found as predicted that subjects identified as high in need achievement and high in fear of failure were like the rest of the subjects in the sample in the average amount of information demanded and variability in information demanded. Subjects identified as low in need achievement and low in fear of failure were found to be like the rest of the subjects in the sample in the average amount of information demanded and variability under non-payoff conditions. Under payoff conditions they showed significantly greater variability in the amount of information demanded prior to making a decision.

Conclusions

Based on the results of this investigation the following conclusions were reached:

1. Subjects will take greater risks under payoff conditions than under non-payoff conditions when making a decision for which additional information costs money.
2. Broad categorizers will take a more conservative strategy in decision making under non-payoff conditions than narrow categorizers.
3. Category width will not differentiate subjects in their willingness to take risks when making a decision for which success brings a monetary reward.
4. Money has no absolute value to individuals; its subjective value can be measured.
5. When making decisions for which success brings a monetary reward and there is a cost for information, subjects who value the reward more will take greater risks.

6. Need achievement, considered by itself, will not differentiate subjects in their willingness to make risky decisions.
7. Fear of failure, considered by itself, will not differentiate subjects in their willingness to make risky decisions.
8. The motives fear of failure and the need to achieve when considered together will not differentiate subjects' risk taking behavior in decision making when that decision task is an isolated experience.

Additional Inferences

1. In general, when there is no reward or incentive, the motives fear of failure and the need to achieve are not elicited to differentiate subjects' strategies in decision making. Also, with no incentive an individual's intelligence will not be employed to develop a strategy.
2. When a monetary incentive is offered, the subject's value of money will affect his behavior when making decisions, overriding motives such as the need to achieve and fear of failure.
3. Subjects who are bright will not use their intelligence until it is useful to do so. With a monetary incentive, they will develop a strategy of risk to obtain greater monetary rewards.

Implications

The results have implications which are relevant to decision theory and theories of risk taking as well as to education.

Implications for Decision Theory and Theories of Risk Taking

The finding that monetary incentive will increase subjects' risk taking behavior supports the research in decision theory that states that subjects in real gambling situations will prefer bets with low probabilities of winning and large monetary payoffs as opposed to bets with a high probability of winning and low monetary payoffs.

The difference between the degree of risk-taking for broad and narrow categorizers under non-payoff conditions and lack of difference under payoff conditions may explain the lack of consistent results of studies focussing on category width as a risk taking dimension.[1,2] It may well be that the cognitive strategies that distinguish the broad categorizer from the narrow categorizer do not operate under conditions of heightened risk or with monetary incentives where other motives may be elicited.

The finding that the utility of reward did affect subjects' decisions lends support to Edwards' decision theory model.[3] This study did indicate the worth of utility as a concept and that in fact people

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[1] Kogan and Wallach, op. cit.

[2] Pettigrew, op. cit.

[3] Edwards, op. cit. Annual Review of Psychology

do not view money the same way. It further indicated that the assumption of monetary rewards in laboratory experiments as a way to get people ego-involved in a meaningful situation needs to be rethought. The monetary reward itself cannot be considered a constant; it is also having differential effects on subjects' behavior.

The lack of finding any definite relation between the interaction of fear of failure and the need to achieve and the willingness to take risks in the decision task under study has several implications for Atkinson's theory of achievement motivation.[1] It seems to indicate that his theory does not apply to a decision situation in which information seeking is required. The results may also indicate that Atkinson's theory may only apply to group competitive situations and not to risk decisions made under isolated conditions. The results may point to the lack of clarification of the motives fear of failure and the need to achieve by the use of so many different measuring instruments. Also, the theory may have to be rethought in situations for which there are monetary incentives, because of the possible competing motives elicited.

The fact that subjects who were high in numerical ability did not utilize their ability until it became useful has implications for many theories and even research in the area of creativity. This behavior implies something like a principle of "conservation of energy." Subjects will use the least amount of energy necessary in order to accomplish a task. Unless it is made clear on tests that the results will have meaning for them, there is no reason for subjects to respond in a way that expends extra energy. Actually that is the most intelligent strategy.

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[1] Atkinson and Feather, op. cit.

Implications for Education

Under conditions in which there are no specific goals, which vary in their subjective value for individuals, subjects do seem to employ a consistent cognitive strategy in the amount of information they require before they will come to a decision. This was seen to be unrelated to intelligence. Therefore, when students are involved in concept formation, in all areas of learning, it would be important to consider that some students require more examples than others, and that this is due to a difference in learning strategy rather than ability. This gives emphasis to the consideration of individual differences in learning style which cannot be dealt with solely by ability grouping. Maybe this serves to add reinforcement to those methods of education that advocate individualized learning in which each child is able to learn at his own pace, and in keeping with his own learning style.

Also to be noted is that one cannot assume that a student does not have ability if he is not performing in a situation that is not meaningful to him. Unless goals are made clear and meaningful students may not necessarily use their aptitude to develop intelligent strategies for learning. The results may also indicate the degree to which students' behavior are bound by external rewards such as grades. Money may provide the societal incentives but the key to obtaining the doors to riches are defined in terms of school marks.

Recommendations for Further Research

Since it has been found that money has different meaning for individuals and that this can affect their behavior in decision making, this again raises the need for caution in interpretation of the results in laboratory experiments in which monetary incentives are used. This study has shown that money has no absolute value. In a Capitalist society where money has become a yardstick of success, money has become a source of gratification for many needs. Therefore, the assumption in future experimentation that the subjective value of money can be ignored as an influencing variable would no longer be appropriate.

It would be of value to determine what it is that distinguishes the person who values money more from the person who gives it less subjective value. In a society which gives recognition to the entrepreneur, the man who strives for money as his goal and is willing to take risks for it may be valued, but what of the cultivation of other valued goals? What is it that contributes to these differences? And as an extension of this, one would have to ask, that if a man takes greater risks for money, what would he be willing to risk for it? What are the limits of his risk taking? Is the difference in the subjective value of money related to socioeconomic differences?

It would also be of interest to explore the relation between the subjective value of a reward and a measure of risk taking within different levels of the need to achieve and fear of failure. In other words, another approach to research in personality would be to examine the effect of specific motivational variables as moderators.

Also to be explored in the future is the individual's subjective view of the experimental situation. Even though the situation may be designed to be one of skill, the individual may view it as being completely out of his control. Behavior that are elicited in chance and skill situations are distinctly different.

Another logical follow-up of this study would be an examination of differences in information demand when individuals are given feedback. For decisions such as vocational choice in personnel selection there is no immediate feedback of success or failure and the situation becomes analogous to that in this study; but what of those situations in which an individual is learning "who is to be trusted?"

One last point is focussed on an area given much emphasis in research, programmed instruction. Programmed instruction feeds information to the learner upon which he is tested and given immediate feedback. This learning situation appears to be analogous to the one under study and may in some instances even take into account individual differences in information gathering behavior. Thus far, studies in programmed instruction have not been given this focus and may be ignoring an important aspect of its success or failure.

BIBLIOGRAPHY

BIBLIOGRAPHY

Arrow, K. J. "Utility and Expectation in Economic Behavior," in *Psychology: A Study of a Science*, Sigmund Koch (ed.), New York: McGraw-Hill Book Co., 1963.

Atkinson, J. W. "Motivational Determinants of Risk-Taking Behavior," *Psychological Review*, 1957, *64*, 359-372.

Atkinson, J. W. *Motives in Fantasy, Action, and Society*, New York: D. Van Nostrand Company, Inc., 1958.

Atkinson, J. W. *An Introduction to Motivation*, New York: D. Van Nostrand Company, Inc., 1964.

Atkinson, J. W. and Litwin, G. H. "Achievement Motive and Test Anxiety Conceived as Motive to Approach Success and Motive to Avoid Failure," *Journal of Abnormal and Social Psychology*, 1960, *60*, 52-63.

Atkinson, J. W. and Feather, N. T. (eds.), *A Theory of Achievement Motivation*, New York: John Wiley & Sons, Inc., 1966.

Atkinson, J. W. and O'Connor, P. "Neglected Factors in Studies of Achievement-Oriented Performance: Social Approval as Incentive and Performance Decrement," in Atkinson and Feather (eds.), *A Theory of Achievement Motivation*, New York: John Wiley & Sons, Inc., 1966.

Beach, L. R. and Phillips, L. "Subjective Probabilities Inferred from Estimates and Bets," *Journal of Experimental Psychology*, 1967, *75*, 354-359.

Becker, G. "Decision Making: Objective Measures of Subjective Probability, and Utility," *Psychological Review*, 1962, *69*, 136-148.

Becker, G. and McClintock, C. G. "Value: Behavioral Decision Theory,: *Annual Review of Psychology*, 1967, *18*, 239-286.

Bernoulli, D. "Exposition of a New Theory on the Measurement of Risk," in Miller, *Mathematics and Psychology*, New York: John Wiley & Sons, Inc., 1964, pp. 36-52.

Birney, R. C., Burdick, H., Teevan, R. C. *Fear of Failure*, New York: Van Nostrand-Reinhold Company, 1969.

Blalock, H. M. Jr. *Social Statistics*, New York: McGraw-Hill Book Company, Inc., 1960.

Brody, N. "n-Achievement, Test Anxiety, and Subjective Probability of Success in Risk-Taking Behavior," *Journal of Abnormal and Social Psychology*, 1963, *66*, 413-418.

Bruner, J. S., Goodnow, J. J. and Austin, G. A. *A Study of Thinking*, New York: John Wiley & Sons, Inc. (Science Editions, Inc.), 1962.

Cellura, R. A. "The Application of Psychological Theory in Educational Settings: An Overview," *American Educational Research Journal*, 1969, *6*, 349-382.

Clark, R., Teevan, R. and Ricciuti, H. "Hope of Success and Fear of Failure as Aspects of Need for Achievement," *Journal of Abnormal and Social Psychology*, 1956, *53*, 182-186.

Cohen, J. *Multiple Regression as a General Data-Analytic System*, unpublished manuscript, March, 1967.

Cohen, J. *Behaviour in Uncertainty*, New York: Basic Books, Inc., 1964.

Coombs, C. H. *A Theory of Data*, New York: John Wiley & Sons, Inc., 1964.

Coombs, C. H., Bezembinder, T. G., and Goode, F. M. "Testing Expectation Theories of Decision Making without Measuring Utility or Subjective Probability," *Journal of Mathematical Psychology*, 1967, *4*, 72-103.

Coombs, C. H. and Komorita, S. S. "Measuring Utility of Money Through Decisions," *American Journal of Psychology*, 1958, *71*, 383-389.

Coombs, C. H. and Pruitt, D. G. "Components of Risk in Decision Making: Probability and Variance Preferences," *Journal of Experimental Psychology*, 1960, *60*, 265-277.

Darlington, R. B. *Nonlinear Regression Equations*, unpublished manuscript.

Darlington, R. B. "Multiple Regression in Psychological Research and Practice," *Psychological Bulletin*, 1968, *69*, 161-182.

Davidson, D., Suppes, P. and Siegel, S. *Decision-making: An Experimental Approach*, Stanford: Stanford University Press, 1957.

Edgett, G. L. "Multiple Regression with Missing Observations Among the Independent Variables," *American Statistical Association Journal*, March, 1956, 122-131.

Edwards, A. L. *Experimental Design in Psychological Research*, New York: Holt, Rinehart & Winston, 1960.

Edwards, W. "The Theory of Decision Making," *Psychological Bulletin*, 1954, *51*, 380-417.

Edwards, W. "Behavioral Decision Theory," Annual Review of Psychology, 1961, 12, 473-498.

Edwards, W. and Slovic, P. "Seeking Information to Reduce the Risk of Decisions," American Journal of Psychology, 1965, 78, 188-197.

Elashoff, J. D. "Analysis of Covariance: A Delicate Instrument," American Educational Research Journal, 1969, 6, 383-401.

Escalona, S. K. "The Effect of Success and Failure Upon the Level of Aspiration and Behavior in Manic-Depressive Psychoses," University of Iowa Studies of Child Welfare, 1940, 16, 199-302.

Evans, S. H., Anastasio, E. J. "Misuse of Analysis of Covariance when Treatment Effect and Covariate are Confounded," Psychological Bulletin, 1968, 69, 225-234.

Feather, N. T. "Subjective Probability and Decision under Uncertainty," Psychological Review, 1959, 66, 150-164.

Feather, N. T. "The Relationship of Persistence at a Task to Expectation of Success and Achievement-Related Motives," Journal of Abnormal and Social Psychology, 1961, 63, 552-561.

Feather, N. T. "The Study of Persistence," Psychological Bulletin, 1962, 59, 94-115.

Feather, N. T. "The Relationship of Expectation of Success to n-Achievement and Test Anxiety," Journal of Personality and Social Psychology, 1965, 1, 118-126.

Ferguson, G. A. Statistical Analysis in Psychology and Education (2nd Edition), New York: McGraw-Hill Book Company, Inc., 1966.

Festinger, L. "A Theoretical Interpretation of Shifts in Level of Aspiration," Psychological Review, 1942, 49, 235-250.

Fishburn, P. C. Decision and Value Theory, New York: John Wiley & Sons, Inc., 1964.

French, E. G. and Lesser, G. S. "Some Characteristics of the Achievement Motive in Women," Journal of Abnormal and Social Psychology, 1964, 68, 119-128.

Garrett, H. E. Statistics in Psychology and Education, New York: David McKay Company, Inc., 1965, 426-443.

Gentile, R. J. and Schipper, L. M. "Personality Variables in Probability-Learning, Decision-Making, and Risk-Taking," Perceptual and Motor Skills, 1966, 22, 583-591.

Glass, G. U. and Hakstian, R. A. "Measures of Association in Comparative Experiments: Their Development and Interpretation," American Educational Research Journal, 1969, 6, 403-414.

Guilford, J. P. Psychometric Methods, New York: McGraw-Hill Book Company, Inc., 1954.

Horst, P. Psychological Measurement and Prediction, Belmont (Calif.): Wadsworth Publishing Company, Inc., 1966.

Irwin, F. "Stated Expectations as Functions of Probability and Desirability of Outcomes," Journal of Personality, 1953, 21, 329-335.

Irwin, F. and Smith, W. A. S. "Further Tests of Theories of Decision in an 'Expanded Judgment' Situation," Journal of Experimental Psychology, 1956, 52, 345-348.

Irwin, F. and Smith, W. A. S. "Value, Cost, and Information as Determiners of Decision," Journal of Experimental Psychology, 1957, 54, 229-232.

Kogan, N. and Wallach, M. A. Risk Taking: A Study in Cognition and Personality, New York: Holt, Rinehart & Winston, 1964.

Kogan, N. and Wallach, M. A. "Risk Taking as a Function of the Situation, the Person, and the Group," in New Directions in Psychology III, New York: Holt, Rinehart and Winston, 1967.

Levitt, E. E. The Psychology of Anxiety, New York: Bobbs-Merrill Company, Inc., 1967.

Littig, L. W. "Effects of Motivation on Probability Preferences," Journal of Personality, 1963, 31, 417-427.

Litwin, G. H. "Achievement Motivation, Expectancy of Success and Risk-Taking Behavior," in Atkinson and Feather (eds.), A Theory of Achievement Motivation, New York: John Wiley & Sons, Inc., 1966, pp. 103-115.

Liverant, S. and Scode, A. "Internal and External Control as Determinants of Decision Making under Conditions of Risk," Psychological Reports, 1960, 7, 59-67.

Luce, D. R. Individual Choice Behavior: A Theoretical Analysis, New York: John Wiley & Sons, Inc., 1959.

Luce, D. R. and Raiffa, H. Games and Decisions: Introduction and Critical Survey, New York: John Wiley & Sons, Inc., 1967.

Mahone, C. H. "Fear of Failure and Unrealistic Vocational Aspiration," Journal of Abnormal and Social Psychology, 1960, 60, 253-261.

Mandler, G. and Sarason, S. B. "A Study of Anxiety and Learning," Journal of Abnormal and Social Psychology, 1952, 47, 166-173.

Messick, S. and Kogan, N. "Category Width and Quantitative Aptitude," Perceptual and Motor Skills, 1965, 20, 493-497.

Miller, G. Mathematics and Psychology, New York: John Wiley & Sons, Inc., 1964.

Morgan, J. N. "The Achievement Motive and Economic Behavior," Economic Development and Cultural Change, 1964, 12, 243-267.

Mosteller, F. and Nogee, P. "An Experimental Measurement of Utility," Journal of Political Economics, 1951, 59, 371-404.

Moulton, R. W. "Effects of Success and Failure on Level of Aspiration as Related to Achievement Motives," Journal of Personality and Social Psychology, 1965, 1, 399-406.

Murray, E. J. Motivation and Emotion, Englewood Cliffs (N. J.): Prentice-Hall, Inc., 1964.

Murray, H. A. Explorations in Personality, New York: Oxford University Press, 1938.

McClelland, D. C. "Risk Taking in Children with High and Low Need for Achievement," in Atkinson (ed.), Motives in Fantasy, Action and Society, New York: D. Van Nostrand Company, Inc., 1958, pp. 306-321.

McClelland, D. C. The Achieving Society, New York: D. Van Nostrand Company, Inc., 1961.

McClelland, D. C., Atkinson, J. W., Clark, R. A. and Lowell, E. L. The Achievement Motive, New York: Appleton-Century-Crofts, Inc., 1953.

McClelland, D. C., Clark, R. A., Roby, T. B. and Atkinson, J. W. "The Projective Expression of Needs. IV. The Effect of the Need for Achievement on Thematic Apperception," Journal of Experimental Psychology, 1949, 39, 242-255.

McClelland, D. C. and Liberman, A. M. "The Effect of Need for Achievement on Recognition of Need-Related Words," Journal of Personality, 1949, 18, 236-251.

McNemar, Q. Psychological Statistics (3rd Edition), New York: John Wiley & Sons, Inc., 1962.

Pettigrew, T. F. "The Measurement and Correlates of Category Width as a Cognitive Variable," Journal of Personality, 1958, 26, 532-544.

Pollatsek, A. and Tversky, A. "A Theory of Risk," Michigan Mathematical Psychology Program Technical Report No. MMPP 69-6, University of Michigan, 1969.

Raiffa, H. *Decision Analysis: Introductory Lectures on Choices Under Uncertainty*, Reading (Mass.): Addison-Wesley, 1968.

Ramsey, F. P. *The Foundations of Mathematics*, New York: Harcourt Brace, 1931.

Raphelson, A. C. "The Relationship Between Imaginative, Direct, Verbal, and Physiological Measures of Anxiety in an Achievement Situation," *Journal of Abnormal and Social Psychology*, 1957, *54*, 13-18

Rapoport, A. *Two-Person Game Theory: The Essential Ideas*, Ann Arbor: University of Michigan Press, 1966.

Restle, F. *Psychology of Judgment and Choice*, New York: John Wiley & Sons, Inc., 1961.

Roberts, J. S. Jr. "Information-Seeking in Sequential Decision-Making as Dependent upon Test Anxiety and Upon Prior Success or Failure in Problem Solving," in Taylor (ed.), *Experiments on Decision-Making and Other Studies*. Arlington (Va.): ASTIA, 1960 (Technical Report No. 6, AD 253952) pp. 26-37.

Sarason, S. B. and Gordon, E. M. "The Test Anxiety Questionnaire: Scoring Norms," *Journal of Abnormal and Social Psychology*, 1953, *48*, 447-448.

Scott, W. A. "The Avoidance of Threatening Material in Imaginative Behavior," *Journal of Abnormal and Social Psychology*, 1956, *52*, 338-346.

Shubik, M. (ed.), *Game Theory and Related Approaches to Social Behavior*, New York: John Wiley & Sons, Inc., 1964.

Siegel, S. "A Method for Obtaining an Ordered Metric Scale," *Psychometrika*, 1956, *21*, 207-216.

Siegel, S. "Level of Aspiration and Decision Making," *Psychological Review*, 1957, *64*, 253-262.

Siegel, S., Siegel, A. and Andrews, J. *Choice Strategy, and Utility*, New York: McGraw-Hill Book Company, 1964.

Smith, C. P. "The Influence of Testing Conditions on Need for Achievement Scores and Their Relationship to Performance Scores," in Atkinson and Feather (eds.), *A Theory of Achievement Motivation*, New York: John Wiley & Sons, Inc., 1966, pp. 277-297.

Solberg, P. O. *A Study of Decision Making*: Job Choice, Boston: Massachusetts Institute of Technology, 1966.

Solomon, H. (ed.), Mathematical Thinking in the Measurement of Behavior, Glencoe (Ill.): Free Press, 1960.

Tversky, A. "Utility Theory and Additivity Analysis of Risky Choices," Journal of Experimental Psychology, 1967, 75, 27-36.

Veroff, J., Wilcox, S. and Atkinson, J. W. "The Achievement Motive in High School and College Age Women," Journal of Abnormal and Social Psychology, 1953, 48, 108-119.

Veroff, J., Atkinson, J., Feld, S. and Gurin, G. "The Use of Thematic Apperception to Assess Motivation in a Nationwide Interview Study," Psychological Monographs, 1960, 74, Whole No. 499.

Von Neumann, J. and Morgenstern, O. Theory of Games and Economic Behavior, New York: John Wiley & Sons, Inc. (Science Editions), 1964.

Weinstein, M. S. "Achievement Motivation and Risk Preference," Journal of Personality and Social Psychology, 1969, 13, 153-172.

Westcott, M. R. "On the Measurement of Intuitive Leaps," Psychological Reports, 1961, 9, 267-274.

Westcott, M. R. Toward a Contemporary Psychology of Intuition, New York: Holt, Rinehart & Winston, Inc., 1968.

Winer, B. J. Statistical Principles in Experimental Design, New York: McGraw-Hill Book Company, 1962.

Worley, D. R. "Amount and Generality of Information-Seeking Behavior in Sequential Decision-Making as Dependent on Level of Incentive," in Taylor (ed.), Experiments on Decision-Making and Other Studies, Arlington (Va.): ASTIA, 1960 (Technical Report No. 6, AD 253952), pp. 1-11.

APPENDIXES

APPENDIX I

Additional Tables

TABLE 17

Means and Standard Deviations for 168 Subjects on all Variables

Variable	Mean	Standard Deviation
Numerical Ability	21.61	8.12
Category Width	58.05	21.60
Fear of Failure	265.12	48.15
Need to Achieve	8.58	4.09
Utility of Reward	20.20	4.19
Information Demand Non-Payoff	24.36	15.60
Information Demand Payoff	13.12	10.77

TABLE 18

Means and Standard Deviations on Dependent Variables for Subjects Identified as High and Low on Independent Variables

Independent Variable	Level	N	Information Demand			
			Non-Payoff		Payoff	
			Mean	S.D.	Mean	S.D.
Category Width	Broad	67	27.80	14.73	11.54	10.09
	Narrow	58	20.75	16.14	12.06	10.55
Fear of Failure	High	65	22.51	14.07	12.93	8.75
	Low	62	24.32	17.09	13.22	11.67
Need to Achieve	High	73	25.77	15.49	13.37	10.99
	Low	68	22.54	14.43	12.87	9.89
Utility of Reward	High	74	-	-	9.73	9.24
	Low	84	-	-	16.64	11.53
Fear of Failure and Need to Achieve	High Low	31	22.48	13.73	12.14	8.87
Fear of Failure and Need to Achieve	Low High	27	26.31	17.80	12.14	9.45
Fear of Failure and Need to Achieve	High High	31	23.94	14.50	13.91	8.89
Fear of Failure and Need to Achieve	Low Low	20	20.43	14.68	13.55	12.50

TABLE 19

Intercorrelation Matrix

Variable	Numerical Ability	Category Width	Fear of Failure	Need to Achieve	Utility of Reward	Information Demand Non-Payoff	Information Demand Payoff
Numerical Ability	1.000	.124	-.283**	.138	.172*	.042	-.218**
Category Width		1.000	-.057	-.087	-.036	.097	-.055
Fear of Failure			1.000	-.089	-.119	-.073	.012
Need to Achieve				1.000	.082	.142	.047
Utility of Reward					1.000	-.065	-.304**
Info Demand Non-Payoff						1.000	.300**
Info Demand Payoff							1.000

**p < .01

*p < .05